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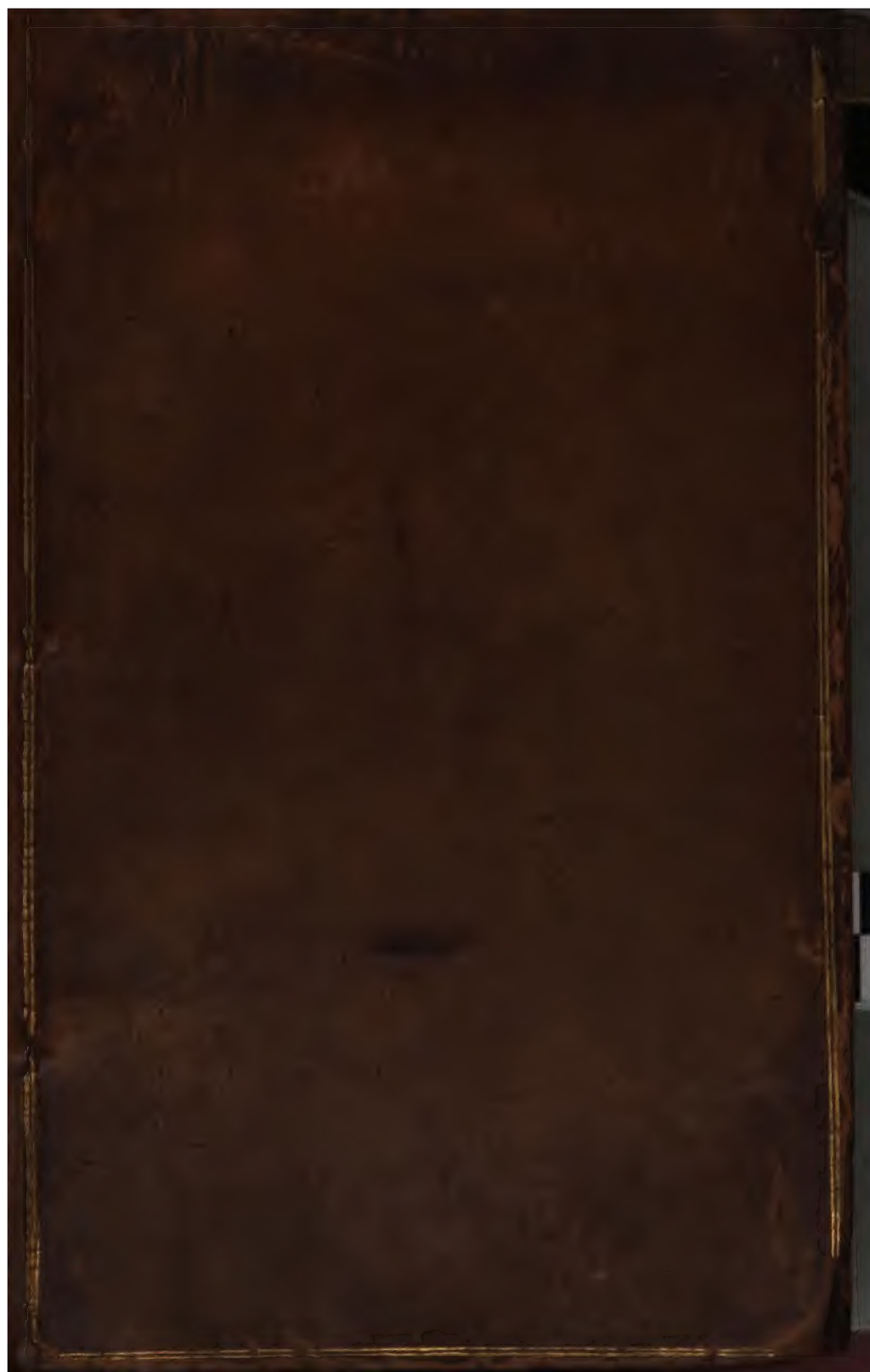
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THE HANDMAID TO THE ARTS, TEACHING,

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|---|--|
| <p>I. A perfect knowledge of the <i>materia pictoria</i>: or the nature, use, preparation, and composition, of all the various substances employed in painting; as well vehicles, dryers, &c. as colours: including those peculiar to enamel and painting on glass.</p> <p>II. The several devices employed for the more easily and accurately making designs from nature, or depicted representations; either by off-tracing, calking, reduction, or other means: with the methods of taking casts, or impressions, from figures, busts, medals, leaves, &c.</p> | <p>III. The various manners of gilding, silvering, and bronzing, with the preparation of the genuine gold and silver powders, and imitations of them, as also of the fat oil, gold sizes, and other necessary compositions:—the art of japanning as applicable not only to the former purposes, but to coaches, snuff-boxes, &c. in the manner lately introduced:—and the method of staining different kinds of substances with all the several colours.</p> |
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The whole being calculated, as well for conveying a more accurate and extensive knowledge of the matters treated of to artists; as to initiate those, who are desirous to attempt these arts, into the method of preparing and using all the colours, and other substances employed in *painting in oil, miniature, enamel, varnish, and fresco*; as also in *gilding, &c.*

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T O T H E

Noblemen and Gentlemen,

Members of the Society for the Encouragement
of Arts, Manufactures, and Commerce.

My Lords
and
Gentlemen,

THE correspondence betwixt the design of this work and the views, on which you have formed yourselves into a society, naturally points out to me, to whom it may be addressed with the greatest propriety : and the sense of that gratitude due to you from myself and every other member of the community, for your zealous application to promote the national interest, in some of the most important though much neglected matters, gives me a pleasure in embracing this opportunity of expressing my acknowledgments of it.

The furnishing means of establishing and improving useful arts, especially those which relate to considerable manufactures, and the creating incitements and motives to the exercise of those means, (however minute and trivial some necessary particulars of them may appear to those who have not duly weighed the nature and consequence of such affairs,) are

DEDICATION.

yet, to a country that owes its riches, power, and even domestic security to commerce, of the greatest concern and moment : and it is more peculiarly meritorious in those, who in a private capacity exert their utmost endeavours on these accounts; as such pursuits seem to take up a very little share of the regard of the public here, at a time, when all the neighbouring governments (and especially that of our rival France) make them a principal object of their attention and care. To you, therefore, I dedicate this book : as it is not only in your power, but intirely within the sphere of your professed intentions, to inforce, in a more extensive and publicly beneficial way, the practice of many particulars taught in it ; and as it affords me an occasion of declaring that high estimation of the undertaking of your society, and consequential respect for the members of it, which is entertained by

My Lords and Gentlemen,

Your most obedient,

and humble Servant,

The AUTHOR.

P R E F A C E.

THAT the national improvement of skill and taste in the execution of works of design is a matter of great importance to any country, not only on account of the honour which is derived to civilized nations by excelling in the polite arts, but likewise of the commercial advantages resulting from it, will be allowed by all, who have not very singular notions with respect to these matters: though, in what degree such improvements are essentially interesting to us at present, is scarcely conceived by any, unless those who particularly concern themselves in speculations of this nature. The strong disposition, that prevails not only in the European countries, but in the respective settlements of their people in Asia and America, for using those decorations and ornaments in dress as well as buildings and furniture, that employ the arts of design, gives at present the foundation to several of the most considerable branches of trade: which are daily increasing, with the luxury, that seems removing from the East, and spreading itself over these Western countries and their colonies, in such manner as will probably soon render some articles of this kind equal, in the return, to the most

staple and extensive of those of the former commerce. And, as several circumstances both of our æconomical and political condition, by enhancing to a very high degree the price of common necessaries, and introducing more expensive modes of life, are depriving us of the share we had of the grosser manufactures that depend on labour, it peculiarly beboves us to exert ourselves in cultivating those of a more refined nature; where skill and taste (in which we by no means seem naturally wanting) are required to give a higher value to the work, and stand in the place of a greater proportion of manual operation.

It must be with regret, therefore, we see the French have got greatly the start of us in this very material pursuit: and that the encouragement given by the government, together with the opportunities afforded by a well instituted academy, has diffused such a judgment and taste in design among all classes of the artisans, as render France at this time the source of nearly all invention of fashions; and necessarily occasion an extreme great demand from her for all those articles, in the production of which such talents are exercised.

The advantages, which France has now over us in these concerns, are not however so well secured, that we should despair of being able, in time, to wrest them out of her hands: for where the mechanical part, either as it depends on machines or manual dexterity, is in question, we have given on all occasions the proofs of superior abilities: and whenever, therefore, the improve-
ment

ment of fancy and propriety in the designing of models and patterns shall be so far advanced here, as to put us nearly on a level with her in those points, we shall soon become as formidable a rival to her, in what she now considers her peculium, as she has in a parallel manner been before to us, in the woollen trade, from our advanced price of labour.

The measures, by which this very desirable end may be attained, consist of three particulars: the founding a well regulated academy, where not only youth and novices may have an opportunity of being well initiated in the principles of design; but where even artists themselves may have the means of and inducement to further study, in order to the strongest exertion of their genius;—the creating such incitements, by pecuniary rewards or honorary distinctions, to excel in these arts, and more especially in the application of them to the perfecting those manufactures, to which they have any relation, as may stimulate the more indolent, and raise greater emulation among the forward, to apply their utmost powers to excel;—and the diffusing a more general and accurate knowledge of those secondary or auxiliary arts that are requisite to the practising design; or to the execution of works dependant on it. The first of these means, viz. the erecting an academy of arts, we must hope, when the government shall be freed from the embarrassing concerns of a war, will be thought an object worthy their notice and care; since it is too apparent, from the failure of the attempts already made, that nothing effectual

with regard to it can result from the efforts of private persons: the second, we have great reason to flatter ourselves, will, in time, be adequately procured by the laudable endeavours of the society constituted for that end; and which, from the continual accession of members, seems to promise the procuring of ample funds for the purpose: the last are intended to be supplied by this work; but with what title to success, I must leave it to the judgement of the public to determine: only I will take the liberty of observing somewhat more explicitly here, in what particular manner it is proposed to be conducive to this end.

A dissertation on the Materia Pictoria makes the first part: where the natural history, preparation, and use, of not only the substances of which colours are formed, but of all others rendered fit for use in any way to the purposes of painting, are distinctly taught, with the means of competition, and the application of them: as they depend either on mechanical, or chemical operations. The author's end in this dissertation is to enable the student to know almost every thing to do with them, and to comprehend how they are employed in the various parts of painting, and in the various parts of the arts and manufactures which depend on them. The second part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The third part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The fourth part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The fifth part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The sixth part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The seventh part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The eighth part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The ninth part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them. The tenth part of the work is a dissertation on the Materia Pictoria, in which the author treats of the various parts of the art of painting, and of the various parts of the arts and manufactures which depend on them.

lours, from the sordidness and ignorance of the Jews, and other low people concerned in the preparation of them, is a disadvantage of the highest moment to such as paint, even with the greatest skill, either in oil or water, and what they can find no apposite remedy against without some aid of this kind. For, as the preparation of colours is kept a secret in the hands of those few who manufacture them, either here or abroad, and consequently is very little known to modern painters; and a much greater share of knowledge in natural history, experimental philosophy, and chemistry, is required, to the understanding the nature of the simples, and principles of the composition, in a speculative light, than is consistent with the study of other subjects more immediately necessary to an artist; there remains no means of surmounting this difficulty, but by being supplied, by some person, whose application could be more properly directed to the attainment of this science, with such a system of the theory and practice of every thing relating to the *Materia Pictoria*, as may enable them either to prepare the colours themselves, where not to be otherwise obtained perfect; or to judge critically with some certainty of the goodness of such as they procure from others. This I have therefore attempted on their behalf: and I hope not in vain; as not only a general acquaintance with the practice of the several branches of the chemical art, but a very large experimental inquiry into the nature of these subjects in particular, form my pretensions to some knowledge of them.

As the depravity of the manner of preparation has also extended itself to the very priming of cloths for grounds of painting, (a work trusted too neglectfully at present to the care of colour-men), from whence great inconvenience to the painter and detriment to the pictures, are produced, I have subjoined a method, by which those, who are really in earnest about the merit of their performances, may procure cloths to be made without either stiffening, cracking, or causing (as it is called) the colours to sink in: and, as this has an apparent utility with respect to painters in the case of new pictures; so the improvements offered in the methods of cleaning, preserving, and mending, those of older date, are not less obviously beneficial to others possessed of former works. The art of cleaning pictures being indeed of the utmost consequence to the interest of taste: as no lover of the polite arts can reflect, without the utmost regret, on the vast havock made in the works of all the great masters, by erroneous and faulty management in this point.

A complete system of the theory and practice of enamel painting forms the next article: the value of which will be best understood by those, for whose use it is intended: for as this art is of late introduction among us, and the manner of conducting it, with respect to the preparation and composition of the colours, fluxes, and grounds, has been carefully concealed in the places abroad where it has been longer established, a very small share of knowledge in the preparation of the colours,

lours, and yet less of that of the grounds and fluxes, is the whole hitherto gained by the artists of this country: who are mostly obliged to employ a white enamel prepared at Venice for their ground; to pick up the remains of a kind of glass formerly made there for a flux; and to procure the colours, either in a more perfect or faulty state as they can meet with them; except in the case of those who have recipes for some kinds which they prepare, but with that precariousness of the qualities, that attends the blindly following recipes, without any comprehension either of the general properties of the ingredients, or principles of the operations. From which circumstances, uncertainties in the success and embarrassments in the work are the frequent result; as well from a want of understanding the nature of the substances they use, as the not being able to procure what is good of each kind, or fit for their particular purpose.

The assisting in the cultivation of the art of enamelling here was indeed one principal object of the design of this book: as that art is very materially interesting to us at present; being become the basis of a manufacture, from which we may expect great advantages; since we already see it carried suddenly to such a degree of perfection with respect to the facility of working, as to raise a demand for the produce in foreign markets; notwithstanding the long practice and cheap living of the people of Geneva, who had been in possession of this branch of commerce for

for a considerable time, gave them originally the greatest advantages in it over us.

The painting on glass with vitreous colours is not a matter of equal importance with enamelling: but, as it is considered as one of the arts of which the mystery is at present lost to us, (though, on the contrary, being in fact nothing more than painting with transparent enamel colours on glass grounds by much the same methods, the modern improvements made in the art of enamelling have given us an equal superiority in this,) I thought it a necessary part of the work; and have accordingly entered on an explanation of the whole of it; availing myself, nevertheless, of its affinity with enamel painting, so as to refer for most particulars to what was before laid down on that score, and enlarge only on some points in which a difference is found betwixt them. But I flatter myself, that, notwithstanding the brevity of the manner, any person may, by a proper attention to what is delivered on this head, easily make himself master of every thing peculiar to painting on glass.

The gilding enamel and glass by vitreous colours, and annealing, was a necessary appendage to the art of painting in enamel: but there is yet another circumstance which made the communication of the best methods of doing this of some consequence to the public. It is the great demand now subsisting for drinking glasses with gilt edges, which are mostly, at present, either imported from Germany, or fraudulently imitated here by gilding with gum water or sizes that will not bear

bear moisture: though, were the means well understood, they might in large parcels, with very little more expence or trouble, be done in the genuine manner.

The method of taking off mezzotinto prints on glass, which makes the next article, is not a matter of any great moment: but, as the practising it is very alluring, by the production of pictures even without being able to draw, it may be an inducement to some to apply themselves to painting and the study of design; since those will not long rest satisfied with this manner of exercising their fancy, who have a genius for greater things.

The art of washing maps and other prints, is however of more general use: and requires no apology for holding a place in the work.

The devices and mechanical means employed for the more easily and accurately obtaining outline sketches of designs after nature or works of art, which begin the second part, are of the greatest assistance and service to all who paint or draw: and though most of them are known to artists of larger experience; yet beginners are to learn them, and most frequently want an adequate opportunity; on whose account therefore they were necessary for the answering the full intention of this book: and perhaps even such as are more versed in these matters, may meet with something not unacceptable to them in a collection of inventions of this nature, so copious as that here given.

The

The methods of casting in large, which follow in this part, will be much less extensively useful; as it is practised only by few; and the managing it in more difficult cases not easily reducible to rule: but some notice of them were wanting to render the system complete; especially as they are connected, so as not to bear well a separation from them, with those of casting medals and other smaller pieces, and the manner of taking off impressions from various subjects; both which are articles of very general utility.

The displaying the several methods of gilding, which is done in the third part, will be found a convenience to numbers, who would occasionally practise them, if they had the means in their power: and the application of the art of japanning to so many purposes, where a mixture of gilding is required, as the introduction of papier mache has occasioned lately, makes this communication particularly seasonable at present.

Silvering and bronzing have also their utility, though in a less degree than gilding; and therefore properly claim to follow it: as they are in fact only different applications of the same means.

The knowledge of the methods of japanning is at present more wanted than that of any other of the mysterious arts whatever; as it is now demanded to be practised on coaches and other vehicles in a very large and expensive way, by those who till lately were utter strangers to it. Information of this kind, such as is intended to be conveyed in the fourth chapter of this part, is in a peculiar manner requisite to them; that they may the more
easily

easily and readily execute those designs they have shewn themselves capable of making, (when sufficiently paid to afford the due application,) with a taste and judgment, that proves them to be not greatly inferior to the French, in this species of performance, though so lately undertaken by them.

Laquering had too great an affinity with japaning, not to be joined with it in this work; though it is of less consequence. Having, however, been carried by some to much greater perfection here, than in any other country, even to the rivalling gilding in its effect, the communicating the best composition of laquer to numbers, who are either compelled to purchase what they use of particular persons that have the secrets of preparing it, or to employ a very inferior kind of their own production, is not without such advantages, as may make it to be properly considered as one means of improvement in the more elegant manufactures.

The means of staining paper, parchment, wood, ivory, bone, horn, and stones of any kind, with all the variety of colours, make the last contents of this work; and will, I hope, for purposes of real use as well as amusement, be found agreeable to many. Their greatest relation to the arts of design lies, however, in the article of staining stones; from the frequent occasions statuaries, and others who work in marble and alabaster, have to give artificial colours to them: the method of doing which, in a more perfect manner, is, nevertheless, known to very few at present.

These

These are the particular topicks of instruction by which this book is intended to promote the improvement of the arts, and the more curious kinds of manufactures: and excepting engraving, etching, and scraping mezzotintos, they comprehend most subjects that have any immediate relation to them: though some are touched upon in a more copious, and others only in a brief manner, according to the importance of the matter, or the room given for an advantageous enlargement on it.

The articles of engraving and etching, especially as far as regards the composition and application of the two kinds of varnish or ground, and the respective sorts of aquafortis, did very properly belong to the work; and were originally proposed to have been comprized in it: but in seeking after the latest improvements, a favourable opportunity offered of procuring such a quantity of useful matter respecting the present practice of these arts in France, where they have been much more cultivated than here, as would, without suppressing some valuable part, have swelled the volume beyond the expedient bulk; and enhanced the price of it in such a manner, as might have frustrated in some degree the end of the publication of it; by preventing its reaching the hands of many of the lower artisans, for whose use it was in part intended. It was therefore judged more proper to reserve what was proposed to have been given on these heads, together with several other articles that might have been acceptable to particular sets of people, but were of less general

P R E F A C E. xvii

ral utility, and remoter connection with the principal view than those at present inserted, for a supplemental work.

It may probably be imagined, that the ends proposed by this treatise may be answered by the writings of others already published: as there is more than one book in our own language, which pretend to plans not greatly different from that on which it is formed; besides a multiplicity of others that profess to teach particular arts: but on a closer examination I am afraid it will by no means be found that all the volumes which have been compiled on these heads taken together, and much less any single one of the number, have effectually provided the information wanted, or even gone any considerable lengths towards it. One could scarcely believe, nevertheless, without having perused them, that almost every book already written on these subjects so generally interesting should be egregiously defective in matter, form, and veracity; and yet this is almost equally the case of all where they are treated of in a more copious and extensive manner. But it will appear less extraordinary when we find, that the authors were for the most part unacquainted in an experimental way with what they took upon them to teach, and not better qualified with any speculative knowledge that could enable them to judge critically of what they procured on the authority of others, and therefore either blindly copied after former writers, or added implicitly such additional articles as the reports of living persons they inquired of furnished them with; and were perhaps as often deceived

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by the design as the ignorance of those from whom they sought information; being themselves possibly not always very solicitous, so much about the value as the quantity of what they collected.

With respect to the preparation of painter's colours, Neri, in his treatise on glass, seems to have laid the foundation for all the collections of recipes of that kind published here; probably from its becoming known by means of Merret's translation, to the writers, whose reading was not extensive enough to lead them to an acquaintance with Birellus, or the passages in Mathiolus, Wormius, Celsapinus, and others who have occasionally touched on this head.

Caneparius in his book *de atramentis* gave a more extensive view of the preparation and composition of pigments for painting; by adopting what Neri had given, (though he has never quoted him by name) and adding several other particulars omitted by him; as likewise a variety of other practices relating to the arts; but mixt with many erroneous and false accounts both of the processes and the produce of them.

Merret an English physician translated Neri into our language, and gave notes upon him: but not having, as appears, the least light to direct him in his opinions, but what he borrowed from other writers, his observations neither illustrated nor augmented in any material degree the contents of Neri's book.

Kunkel republished in the German language Neri's work with Merret's notes, and his own observations on both: and he also inserted as well
there

there as in his other dissertations on the art of making glass, several processes for the preparation of painters colours much better than those of Neri or the others before him; as likewise many other useful recipes respecting the arts and mysterious trades: but he seems to be the only writer, who has treated these subjects in a more diffuse manner, that was experimentally conversant with what he undertook to teach.

After this Salmon in his Polygraphices took upon him to give instructions for the practice of almost all the arts and mysterious trades: and by the assistance of the former writers, and private information, got together a larger body of matter respecting these subjects than any before him had done: his collection would indeed have had considerable merit at the time it was published, if the valuable parts had not been confounded with such a heap of absurd stuff and falsities as rendered every passage suspicious; and disposed in a manner so void of all order and method, that (an index being wanting likewise,) it was impracticable, without turning over and carefully examining a great number of pages, to find any article required; though several are repeated four or five times over in different places: which difficulty of finding what was wanted, and uncertainty whether what might be found would prove a just account of the matter, or some extravagant blunder or imposition, discouraged those who might have profited by many of his recipes and instructions, from seeking any assistance from him in matters of a more nice or uncommon nature.

But this conduct in digesting with so little care, and debasing with impertinencies and falsehoods, the proper matter of that work is no great ground of wonder in the case of a writer, who, after he found this book met with a good reception from the public, was capable of conspiring with book-sellers to blend a long discourse of chiromantical signatures, or the means of telling fortunes by the lines of the hands, and a mass of the most ridiculous nonsense that has been written on the philosophers stone, with the contents of a treatise professing to convey a practical knowledge of the useful arts, for the sake of enlarging the volume, in order to raise the price, under pretence that valuable additions had been made to the work.

The last performance of this kind was published under the assuming title of the School of Arts: from which name one might have hoped, if not for a complete system of knowledge of this kind, at least for somewhat better than the earlier writers had produced: especially as many amendments of the former practice, as well as the introduction into use of several important inventions, had furnished much ampler matter. But the author instead of shunning their errors, or availing himself of the advantages the present state of things gave him over them, adopted with great augmentation all the defects and faults of those who had gone before him; and formed his work on a plan that deprived him of all opportunity of profiting of the greater advance towards perfection of the modern practice.

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For, being a German, (as I conjecture from his manner of changing the English idiom), he seems to have conceived, that nothing could be added to the labours of his countrymen: and has, therefore, with respect at least to those topics he has touched upon in common with this work, confined himself to translating and compiling from Kunkel, and other Germans; who being of older date could not supply him with the improvements and inventions of the present time. In consequence of which conduct, obsolete and insufficient methods are taught, instead of the modern and effectual: and many of the most material articles wholly omitted; as, in the instance of gilding, all the instructions are confined to metals.; and with regard even to them, relate only to means now exploded: and many important matters strictly connected with his plan, are not once mentioned in the book; while others of much less consequence, as the method of cbrystallizing silver under the resemblance of a tree, are repeated four or five times over. Like Salmon, he gleaned also together all the extravagancies he could lay hold of, in order to increase the size of the work to the booksellers unreasonable standard: and therefore inserted in his first volume, a most preposterous and lying account of the breeding silk worms by putresced veal, and producing strange serpents by equivocal generation; and in his second volume, a dissertation on the catching, breeding, feeding, and teaching nightingales, which takes up sixteen pages; with a multiplicity of other such

wretched absurdities in both, as greatly disgrace the title of School of Arts; and conduce indeed, from their having been so often admitted into them, to make works of this kind in general contemptible. But what is still most unhappy in the case of this author, he appears neither to have understood the language he translated from, nor that he wrote in: from whence the recipes and observations he has given are so ill delivered, by his mistaking the sense of technical terms, and putting the name of one thing for another, with respect even to substances, as, together with the alterations he has had the vanity to make in them, from the manner they were given by those he took them from, according to his own gross misconceptions, render them frequently unintelligible; and not to be depended upon in many instances.

The pretensions of the ostentatious works, the Cyclopedias, and Encyclopedias, and other such Dictionaries, have not been, however; much more made good than those of the School of Arts: for indeed it is surprising how shamefully silent these books, which profess to comprehend every thing relating to subjects of this kind, are with respect to most of the essential articles; even those where the writings of others had they been industriously consulted, would have furnished what was required: nor is the French Dictionary now publishing, in the least an exception to this; for, on examining it, in order to have informed myself of the methods practised by the French with respect to certain particulars in which they excel, I was surprised to find, that, in some cases, every

every thing concerning them was intirely omitted; and in others, recipes, or other passages, taken from some of the old books with the most injudicious choice, supplied the place of the just account of the improved methods obtained from the ablest practitioners of the several arts, which, in the proposals for this work, were promised to have been given. There is, among many others, a glaring instance of this in the article Carmine: which pigment, being prepared at Paris in much greater perfection than any other place at present, and of the greatest consequence in painting with water colours, was well worth the attention of the compilers of this work: but, instead of any account of the modern and efficacious practice of the preparation of carmine, which is not moreover a secret in the hands of a single person, but known to several who make it together with other colours, all, that is inserted on this head, consists of three recipes taken from the old writers; two of which contains only directions for doing what will be barren of any useful product; and the other a bad process taken from Kunkel for making lake of Brazil wood, which is, nevertheless, praised as the communication of an excellent method of making carmine. I was indeed disappointed in my expectations from that work, with relation to this important article; as it has never been in my power to discover by experiments, or procure by information, the knowledge of the means of preparing carmine of equal goodness with that of the French: but chuse much rather to acknowledge my ignorance

in this point, than, like the preceding writers, to obtrude absurd and fruitless processes on the public, in the place of the proper and effectual.

I am sensible, I run some hazard of a retaliation, in canvassing thus freely the performances of others; since doubtless my own is not exempt from errors and defects. But I thought it a necessary vindication of these kinds of writings, and of my own undertaking in particular, to shew, that the cause of the disregard or even contempt, in which the greatest parts of the books of this kind are held by the more judicious, did not arise from the nature of the subject, but the faulty manner of treating it; through the insufficiency and venality of the authors. And with respect to my own miscarriages, I am so little conscious of having occasioned them, either by neglect, or a mercenary conduct, that I am not in the least diffident of trusting my work to the candour of the impartial, who will excuse some mistakes and omissions, which in taking so great a scope of subject it is almost impossible to avoid, on the score of so many useful articles as will be found to be inserted: for, with respect to the far greatest part, I can vouch them to be authentick and just, either from my own experiments and observations, the information of persons of undoubted veracity who have practised them, or clear deductions from unquestionable principles.

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ADVERTISEMENT.

IF any word occur in the contents of the following pages, which may not be understood by the reader; on consulting the index, a reference will be always found to some place where it is fully explained: this work being intended, along with other purposes, to answer that of a glossary to the technical words and expressions, relating to the subjects treated of, peculiar to painters and other artists.

PART

PART I.

OF THE

MATERIA PICTORIA:

OR,

The nature, preparation, and use of all
the various substances employed in
painting.

CHAP. I.

Of the substances in general used in
painting.

THE principal kind of substances used
in painting is the *COLOURS*: by
which, is to be understood, all the
various bodies employed by painters, for pro-
ducing the difference of hue or teint: but, as
several of these are of a solid consistence, and
an earthy, or incohering texture, it was neces-
sary, as well for the laying them on, and
spreading them properly, as for the binding
and making them adhere to the grounds on
which they are laid, that, in many cases,
somewhat of a fluid nature should be added to
give them an unctuous consistence while used,
and proper degree of tenacity when again dry:

B and,

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and, to this end, many different kinds of bodies have been applied; from whence proper *VEHICLES* have been formed, which, at the same time, answer the double purpose of reducing the colours to a state fit for their being worked with the brush or pencil, and of cementing them to each other and the ground they are laid upon; as also of defending them from being easily injured by accidents.

The substances used in painting may be therefore all considered as of these two kinds; *Colours* and *Vehicles*. For, though there are several used occasionally, which are not immediately subservient to the principal intentions of vehicles; yet, being employed to remedy the defects of those which are, they must be considered as subordinate to them; and ought, consequently, to be classed with such as compose vehicles.

The nature of these secondary intentions, I shall, therefore, point out in its due place; and reduce the substances serving to them to their proper classes accordingly: as it is necessary, in order to understand critically and completely the art of preparing and using the various articles of the *materia pictoria*, to comprehend clearly the general intention in which each is used, as well as to know the particular purpose to which it is applied. And, for the same reason, as also for the sake of being intelligibly concise, I shall treat of the whole under such methodical distinctions as refer to these intentions: adopting, nevertheless, on every

every occasion, the terms of art in common use; and explaining them, according to the meaning they bear when applied with any propriety or precision, by the particular relation they have to these intentions.

CHAP. II. Of Colours.

SECT. I. *Of colours in general.*

CLOURS may be either *PIGMENTS* or fluids. By *pigments*, is meant all such solid bodies as require to be mixed with some fluid, as a vehicle, before they be used as paints, (except in the case of crayons, where they are used dry.) These make the far greatest part of the whole: the fluid colours being only a small number employed along with water colours; and asphaltum, which is sometimes employed in oil painting.

Colours are distinguished into several kinds, according to the vehicles in which they are worked, as oil colours, water colours, enamel colours, &c. As the same sorts of pigments, however, are, in many instances, employed in more than one kind of painting, as vermilion and lake in several, and ultramarine in all. I shall not distribute them into classes, in that view, till I come to speak of their particular application; but treat at present of them promiscuously.

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miscuously in teaching their general nature and preparation ; dividing them according to their affinity in colour only ; since this method of arrangement will not only render each article more easy to be found ; but, at the same time, exhibit to the artist together the whole stock of every kind from whence he must take what he wants on each occasion : by which, he will be the more enabled, to chuse what may best suit his particular purpose. For the same reason, also, this method is certainly more expedient than the disposing them in classes, according to their natural relation to each other, as earths, minerals, vegetables, &c ; which would lead to the like kind of confusion and repetition.

The principal qualities in colours, considered with regard to their perfection or faultiness, are two ; purity of colour, and durability : purity of colour is, by the painters, called *BRIGHTNESS* ; and the defect of it *FOULNESS*, or sometimes the *BREAKING THE COLOUR* : durability is called *STANDING* ; and the negation or want of it *FLYING* or *FLYING OFF* ; which terms, for conciseness, I shall use in speaking of these qualities.

Brightness and *standing* well are the only properties, which are necessary to the perfection of every kind of colours ; and they equally relate to all ; but there are others, which are essential to many sorts, with regard only to particular purposes and uses : such of them, however, as do not fall within the general consideration of the nature of colours, will be treated of in those

those parts of the work where the particular uses of colours come in question.

The most considerable of the more general properties of colours after purity and durability, or *brightness*, and *standing well*, are transparency and opacity; for according to their condition, with respect to these qualities, they are fitted to answer very different kinds of purposes. Colours which become transparent in oil, such as lake, Prussian blue, and brown pink, are frequently used without the admixture of white, or any other opaque pigment; by which means, the tint of the ground on which they are laid retains in some degree its force; and the real colour, produced in the painting, is the combined effect of both. This is called *GLAZING*, and the pigments induced with such property of becoming transparent in oil, are called *glazing colours*. The same holds good also of such colours as are transparent in water; only when they are there used in this manner, they are not called *glazing* but *WASHING* colours. When colours have no degree of such transparency in the vehicle in which they are used, as vermilion, King's yellow; and several others, they are said *TO HAVE A BODY*, and *TO COVER*. The property of *glazing* or *washing* is of so much importance, both in oil and water, that no other method can equally well produce the same effect in many cases, either with regard to the force, beauty, or softness of the colouring: and it is therefore very essential to

the perfection of several kinds of pigments, that they should possess this property in a complete degree; but, in other instances, the using colours with a strong body is not less necessary, especially for the grounding or *laying* in, as it is called, of many objects to be painted.

There is another material quality in colours, that relates only to their use in oil, which is the *drying* well and (as it is called) not *fattening*. By *FATTENING* is meant, a coagulation of the oil, that frequently happens on its commixture with several kinds of pigments, by the effect they have upon it; from whence, after some time keeping, it is rendered of so viscid or glutinous a consistence, as to be wholly incapable of being worked with either brush or pencil. This quality, when found in them, destroys almost wholly the value of such pigments for the purposes of the colourmen; who sell a great part of them ground with oil, and tied up in pieces of bladder, where they are kept till there is a demand for them; which frequently does not happen soon; and, therefore, gives time for their spoiling in consequence of this quality. But to painters, who mix the colours for themselves, on their pallets, with the oil, this property is not an equal inconvenience, when in a lesser degree; only, in general, it must be observed, that colours, in proportion to their tendency to fatten, are slow in drying; and when the oil once contracts this state, it will be a very long time before it will become duly hard and firm in the paintings.

There

There are two other qualities of colour in general that relate only to their tint or hue; but which render them nevertheless fit or improper, in a very material degree, for different purposes. They are distinguished by the names of *WARMTH* and *COOLNESS*: terms which indeed are used very frequently by painters; but, for the most part, very indefinitely, and without any precise or clear meaning. What is meant, when properly used, by *warmth*, is that fiery effect which a small addition of yellow gives to a true red, and that glowing appearance which red imparts to either yellow or blue. By *warmth*, therefore, in red, is to be understood a small inclination towards orange; by the same term, applied to yellow, a like tendency by the admixture of red; and, by the same, again, in the case of blue, must be understood its slightly verging on the purple.

By *coolness*, is to be understood, the opposite to warmth; but this term is seldom used, except in speaking of yellow and blue; and there it means, either the negation of that which causes warmth, or a tendency to green, in either colour, by a slight admixture of the other.

The sense of the word *warmth*, when applied to colouring or the combined appearance of various tints, must not be confounded with that, which it has when speaking of particular colours; for there it relates to the producing a strong effect, by the disposition or contrast of the colours, or the grossness of the tints, and not the qualities peculiar to, or inherent in the colours themselves.

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The colours used in all the several kinds of painting, except some peculiar to enamel, are, as follows.

	CLASS I.	
	Vermilion.	
	Native cinnabar.	
	Red lead.	
	Scarlet oker.	
	Common Indian red.	
	Spanish brown.	
RED.	Terra de sienna burnt.	<i>Scarlet or tending to the orange.</i>
	Carmine.	
	Lake.	
	Rose pink.	
	Red oker.	
	Venetian red	<i>Crimson or tending to the purple.</i>

	CLASS II.	
	Ultramarine.	
	Ultramarine ashes.	
	Prussian blue.	
	Verditer.	
BLUE.	Cendre blue or funders blue.	
	Indico.	
	Smalt.	
	Bice.	
	Litmus or lacmus.	

	CLASS III.	
	King's yellow.	
	Naples yellow.	
	Yellow oker.	
	Dutch pink.	
	English pink.	
	Light pink.	
	Gamboge.	
YELLOW.	Mahcot.	
	Common orpiment.	
	Gall stone.	
	Terra de sienna unburnt.	
	Turpith mineral.	
	Yellow berry wash.	
	Turmeric wash.	
	Tincture of saffron.	

CLASS

USED IN PAINTING,

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CLASS IV.

GREEN. { Verdigrise.
Distilled verdigrise, or chryfals of verdigrise,
Pruffian green.
Terra verte.
Sap green.

CLASS V.

ORANGE. { Orange lake.

CLASS VI.

PURPLE. { True Indian red.
Archal.
Logwood wash.

CLASS VII.

BROWN. { Brown pink.
Bistre.
Brown oker.
Umbre.
Cogn earth.
Asphaltum.
Spanish juice or extract of liquorice.

CLASS VIII.

WHITE. { White flake.
White lead.
Calcined hartshorn.
Pearl white.
Troy white.
Egg-shell white.

CLASS IX.

BLACK. { Lamp black.
Ivory black.
Blue black.
Indian ink.

These are all the colours at present in use, in this country, in any kind of painting, except such as are peculiar to enamel; in which kind of painting, as but few of these are capable of combining

combining with glass, and enduring the necessary heat without changing their nature, or being destroyed, others are employed more suitable to vitrification: for which reason, as the compositions for forming the enamel colours are very various, and bear no particular names, and the management of them has very little relation to other kinds of painting, I shall omit speaking of them till I come to treat particularly of enamel painting.

Of the above enumerated colours, but few are in universal use; most painters having only a select set out of them, and being, in general, unduly prejudiced against those they reject: and some of the best of them, as scarlet oker, terra de sienna, terra verte, true Indian red and umbre in oil painting, and bistre and gall stones in water painting, are, either through their scarcity, or the ignorance which prevails concerning their qualities, at present very little regarded; though some of them were formerly in common use; and all of them might be so with great advantage to the art.

It is no little impediment to their improvement in the profession, that painters are not more extensively acquainted with all the substances fit for their purposes; and more minutely informed of the good as well as the bad qualities of what colours they might use: for many labour under great disadvantages for want of a more copious choice, and the not being better apprized of some of those which suit their own particular manner of working; and
which

which would, in many cases, remove difficulties out of their way, by enabling them to produce effects by more simple methods, and such as are yet more correspondent to their manner, than those they are now obliged to pursue from their defect of proper colours.

As colours are obtained from very various substances, the means of preparing them are, consequently, very various : some being of a simple nature, and requiring only to be purified, and reduced to a proper consistence or texture ; and others being compounds of different bodies, to be formed only by complex and elaborate processes. It is therefore very difficult to give such general directions, for the making every sort of colour, as may be intelligible to all ; the utensils to be employed, as well as the methods to be pursued, being such as belong to different arts and trades : but as the greater part may be done most commodiously by adopting the methods used for performing the common chemical processes, it is the most expedient way to treat of them correspondently to such a view : as, by that means, any who may make themselves acquainted with the common practice of chemistry, for which there are a number of books that afford sufficient assistance, may easily understand the whole art of making colours when taught in this manner. For the sake, however, of those, who may want leisure or disposition to proceed by this method, I will prefix such a description of the instruments, and explanation of the general nature

nature of the operations, as together with the particular directions given in each process, may enable even such as are wholly ignorant of chemistry, if they give a due attention, to get over this difficulty : as indeed, without such a previous knowledge of the nature of the instruments and operations, it would be impracticable to attempt to prepare several of the most valuable colours.

Where, nevertheless, simple means, and the use of such utensils as are generally known, may be sufficient to perform what is wanted ; I shall avoid all technical terms, and more complex methods of operation ; confining myself to such a manner of instruction, as may be universally intelligible.

SECTION II.

Of the utensils, instruments, &c. subservient to the making and preparing colours.

THE apparatus or set of utensils, &c, necessary for making the several colours used by painters, consists of, a furnace for subliming vermilion—another for subliming King's yellow—a third for calcining ultramarine, the coal for Prussian blue, okers, &c.—sublimers—a pewter boiler with its proper furnace—a balneum mariæ—filters—boards for drying the pigments—levigating mills,

mills, stones and mullars—with several other smaller implements subservient to these.

As several of these implements are in common use for other purposes, and consequently to be had ready made of a proper construction, I shall only enumerate them, without entering on any particular description of them: but with respect to that part of the apparatus, which relates to the more secret arts of making several of the colours, and has any thing peculiar in its fabrication, I will endeavour to give such a conception of the proper figure of every particular, and such directions for their construction, as may enable any to procure them to be made by proper workmen. As, without this previous information of the necessary means of performing them, the giving the recipes or processes alone for making the colours would be of very little consequence: and as, by this method, I avoid the necessity of repeating frequently the instructions for those particulars, which when given in a more general way will serve effectually for a multiplicity of occasions.

Of furnaces.

The furnaces are of the most difficult construction of any part of the apparatus for making colours; being most remote from common experience and conception: and yet it is indispensibly requisite, that they should be completely adapted to the purpose they are intended for. I shall therefore be most particular in my directions concerning them: but,
before

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before I enter on that task, it may be previously necessary, to teach the manner of making a composition, which I shall have occasion to direct the use of frequently in my instructions for the building them, as well as on other occasions. I mean the lute for making good the junctures that suffer a great heat, and securing bodies of a tenderer nature from the effects of the fire; which I shall call here, as is done elsewhere, the *fire-lute*: the composition of which is as follows.

“ Take of green vitriol, or copperas, any
 “ quantity; and put it into an earthen pipkin,
 “ of which it may fill only three parts, and
 “ set it on a common fire; taking care that it
 “ may not boil over; which will be very liable
 “ to happen if the fire burn too briskly.
 “ When it has almost done boiling, throw in
 “ more of the vitriol, the quantity at first
 “ thrown in being now shrunk and contracted;
 “ ed; and let that also boil to dryness; and
 “ repeat this till the pipkin be near full of the
 “ dried matter: raise the fire then round it;
 “ and let it continue in as strong a heat as can
 “ be conveniently made, till the whole contents
 “ become of a red colour; after which take it
 “ out of the fire; and, being cold, break the
 “ pipkin, and separate the calcined vitriol from
 “ it. Take then of this calcined vitriol powdered
 “ two parts, of the scoria or clinkers of a
 “ smith’s forge, finely levigated,—Sturbridge
 “ clay or Windsor loom dried, and powdered,—
 “ and fine sand, each one part: mix them well
 “ together;

“ together ; and then temper them, with the
 “ blood of any beast, till they become of the
 “ consistence of mortar ; a twentieth part of
 “ the weight of the whole of short hair being
 “ beaten up with them.”

The furnace for vermilion, as well as the operation to be performed in it, are of the most nice nature of any objects relating to the art of making colours : it is indeed so difficult a thing to manage well the manufacture of vermilion, that it is given up in general in this country, even when the price of quicksilver would make it very profitable ; and the greatest part, if not the whole of the consumption, is supplied from Holland : but if any will prepare well the apparatus as here directed, and execute properly the process given below, they need not doubt, with some experience, but to be able to carry on this manufacture as well as the Dutch. The manner of constructing the furnace may be as follows.

The first step must be to procure the proper iron-work, which consists of bars for bearing the siewel,—a frame,—doors for feeding the fire,—a strong plate for supporting the brick-work over them,—an iron frame and stopper for feeding the fire,—and an iron ring for laying over the top of the furnace, for the better hanging the bodies or subliming vessels in it.

The bars should be of hammered iron, eight in number, eight inches in length, a quarter of an inch in breadth, half an inch in depth, and fixed firmly by each end, at the distance

of a quarter and a half quarter of an inch from each other, into two strong cross-bars; which cross-bars must be sufficiently long to admit of their suffering the brickwork to have good hold of them; and must be made flat at their ends, on that account.

The frame and door must be also of hammered iron. They must be of the length of the area or fire-place as formed by the bars; but need not be more than four inches high. They may be of the usual form of those made for the furnaces of coppers, but stronger; and it is better to have the latch bigger than is common, and carried across the whole door; which will give it strength to resist the weight of the fuel, that, otherwise, when the iron is softened by violent heat, is apt to force the middle part outwards.

The iron bar to lay across the frame of the door may be three inches in breadth; and about three inches longer than the frame itself: it may be either of cast or hammered iron, as shall be found most easy to be procured.

The frame and stopper for feeding the fire should be also of hammered iron: the frame may be four inches long, and three inches high. It may be formed of four plates of a moderate strength; of which those of the top and bottom must slope downwards towards the fire in a parallel; they must also project beyond their joining with the side plates; in order to their being fixed in the brickwork. The stopper must be formed of five plates, put together

together in fashion of a box; (as in the doors of portable iron furnaces;) and of such figure and proportion, as to slide into the hole formed by the frame, and fill it up exactly, so as to render that part of the furnace intire, when it is not taken out occasionally to feed or stir the fire. The hollow of this box or stopper must be turned towards the fire; and filled with fire lute; and a handle must be fixed in the middle of the outward part, for the more commodious use of it when hot.

The iron ring for hanging the bodies or subliming vessels in the fire must be made of cast iron. It should be of about four inches depth, and of a conic form, converging outwards. It should have an outward rim, or margin turning off from the ring horizontally; in order to its lying on the brickwork of the furnace. The diameter of the ring must be in proportion to the size of the sublimers to be hung in it: it should be about two inches wider in the lower part than their diameters; and must diverge or enlarge itself upwards half an inch.

The iron work being thus prepared, and a proper quantity of Windsor bricks, and the loom they are made of, or Sturbridge clay, as well as common bricks, and coal-ash, and common mortar, provided, the dimensions of the furnace must then be thus settled.

Take the diameter of the greatest sublimer intended to be worked in it, and add to it two inches to allow for the lute, if any should be used round it; then add twenty-two inches, and

it will give the diameter of the whole area of the furnace.

The dimensions of the furnace being thus settled, the ground plan must be made in the following manner.

A round of bricks must be laid of the diameter of the area of the whole fabric as settled above, and the bars must be laid in the center of it, in their proper position; and a line drawn close at the back of the furthestmost cross-bar, which must begin a quarter of an inch beyond the insertion of the outermost of the long bars on one side, and extend to a quarter of an inch beyond the outermost bar on the other side. From the extremity of this line, two others must be drawn, parallel to the sides of the outermost bars, and extended to the circular line which marks the area of the whole fabric. The ground plan being so marked, a cylinder of brickwork must be raised in this circle, leaving a hollow square within the lines formed as above for the area of the fire-place and ash-hole. This cylinder must be carried up about eight inches; and may be built of common bricks and coal-ash mortar: but they must be laid solid, that the whole mass may not shrink when subjected to a great heat. When this cylinder of brickwork is raised, the bars of the fire place must be laid over the innermost part of the vacuity left for the ash-hole; and the door, with its frame, must be also placed in their proper position, in the front of the bars: which will not be, in this manner of
con-

construction, on a level with the exterior surface or front of the furnace, as in those of the common kind, but only half the length of the bars from the center of the whole furnaces. The brickwork must be then again carried up six inches higher, in the same manner as before ; only it must be made to take proper hold both of the cross-bars of the fire-grate and the frame of the door : but, in this part of the fabric, the courses next the fire should be of Windsor bricks ; and laid in Windsor loom, or Sturbridge clay.

The fabric being raised to this height, the iron plate prepared for that purpose must be laid over the opening of the brickwork, from the top of the door frame to the exterior surface of the fabric : that the brickwork may be carried intirely round above : and the cylinder of brick must be again proceeded with as before ; only it must be now continued intirely round, forming only an area in the middle ; which must be made sloping from that which is to hold the fuel ; and must enlarge itself in such manner, that, in raising the furnace eight inches higher, the diameter of the cavity may be equal to the diameter of the subliming vessel, with the addition of six inches, to allow for the space in which the fire must come round it on each side.

In the last course of bricks which raise the fabric to this height, the whole must be left for fixing the frame that is to form the opening for feeding the fire ; which must be accordingly

ingly placed in it, in such manner, that the slope formed by the upper plates, which compose it, may incline towards the fire. The proper situation for this hole is in the front of the furnace, over the opening leading to the door of the ash-hole.

From this height the brickwork must be carried up, forming a hollow cylinder, for four inches more ; when a course of bricks, of which the inner ends are cut sloping, must be laid so as to contract the circle of brickwork to the diameter of the iron ring for supporting the sublimer ; which must be then let into this opening left at the top of the furnace, and fixed with fire-lute ; the bricks surrounding it being well pointed with the same. This part of the furnace, from the fire-place to the top, should be intirely built of Windsor bricks, laid with Windsor loom or Sturbridge clay.

In the last course of bricks must be left an opening of four inches length, for venting the smoke into the chimney: over which opening, an iron plate must be laid, and carefully pointed with fire-lute ; that the air may have no access to spoil the draught. The chimney may be about sixteen or eighteen feet high ; and the hollow about six inches square, or of an area equal to that ; and need not be built of a greater thickness of bricks than is necessary in order to its supporting itself.

The furnace for subliming King's yellow must have a sand-pot ; as the heat of the naked fire would be too great. This pot may

be of a greater or less size, according to the quantity of the King's yellow proposed to be made: but, where there is no particular convenience in varying from it, the ordinary size will be found most commodious.

The sand-pot being procured, as likewise the rest of the iron work, according to the preceding directions given for the furnace for vermilion, except the iron ring for the top of the furnace, which in this case must be changed for a flat rim of cast iron of four inches breadth, with a groove to receive the pot, and support it hanging in the furnace, the plan of the furnace must be made out in the following manner. The diameter of the pot being first taken, six inches must be added to it, for the cavity to admit the fire to come round the pot, and the length of two bricks to allow for the thickness of the sides of the furnace: these being put together give the diameter of the whole furnace. To find the due height, the depth of the pot must be first taken; to which must be added ten inches for the distance betwixt the pot and the bars; eight inches for the distance of the bars from the ground, with the height of a brick, for a course that must be carried round the edge of the pot; which, being all put together, give the height. The building may be then carried on, in the same manner as was before advised for the furnace for vermilion, till all be completed but the last course; and the rim must be then laid on the top of the brickwork, and well pointed with

fire-lute : after which, when these parts of the furnace are so dried as to hold well together, the pot should be let down into the furnace where it will hang by its margin or turn edge, resting on the groove made for it in the iron rim : and another course of bricks may then be raised, in a continued line with the sides of the sand-pot, that part of them which touches the pot being laid in fire-lute.

The furnace for calcining the Prussian bluer, ultramarine, &c. may be constructed in the following manner. First prepare a set of bars, which may be a foot in length, and fifteen in number, with a strong frame and door of which the breadth must equal that of the bars, and the height be a foot, as also a plate or two strong flat bars, to support the brickwork over the door frame, and another support the brickwork over the ash-hole. A foundation or pedestal of bricks must then be raised, about three feet and a half high, a two feet four inches square ; which may be done with common bricks and mortar ; and need only, indeed, be four walls ; the hollow formed by which may be filled up with rubbish, and floored over with bricks or tiles. On this pedestal, raise three other walls ; one on each side, and one at the furthest end, the whole brick thickness, forming an area between them, of the length of a foot, and the breadth of ten inches ; of which area the front will necessarily be open from the deficiency of the fourth wall. Over this opening, in the front

front, lay the bars in the center of the brickwork; and place along with them a plate, that will reach from their edge to the extremity of the furnace, to bear the brickwork which must lie over that part of the hollow. Then carry up the sides as before, but with four walls instead of three, to inclose the area of the fireplace intirely; taking care, that the first course have good hold of the flat ends of the cross-bars.

This part must rise eight inches above the bars: and then the door and frame must be fixed; and the other sides carried up as before.

When the building is carried to the height of the door and frame, the strong plate must be laid to bear the brickwork over it: and the hollow must then be made to converge, till it become so narrow as to form a chimney: of which the area of the cavity may be six inches square; or it may be turned into a funnel, or flew, to communicate with any other chimney, if such there be sufficiently near. But, as the wind-furnace demands a very considerable draught, if the flew be made from it into the chimney of any other furnace, which may not happen to be at work when there is occasion to use this, care must be taken to stop the chimney of the other furnace, below the admission of this flew into it, to prevent a false draught which would otherwise intirely destroy its effects on the wind-furnace: and for this end, registers should be always put to the flew, or chimneys below where the flew enter,

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of each furnace, whenever two or more vent themselves into the same common funnel.

Sublimers must be of glass, and may be generally had ready made of a proper figure at the glass-houses, where glasses are blown for the common chemical purposes. They must be inquired for under the name of *bodies*, or cucurbits; which name they bear when applied to medicinal uses. They should be chosen of a spheroidal form; neither the conical shape in which some, nor the oval in which others are made, being so commodious for subliming colours, as a longish spheroid: but, where they cannot be obtained of this figure, an oval may be dispensed with.

The magnitude of the sublimers must be determined by the quantity of matter to be sublimed; and the dimensions of the furnace: but those used in sand-pots should be always at least two inches less in the diameter than the pot in which they are to be placed: and those used in the naked fire should never be more than four inches less in diameter than the iron ring of the furnace in which they are to be hung.

Where vermilion is made in great quantities, earthen sublimers are used; but we shall speak of them in their proper place.

A pewter boiler is necessary for boiling cochineal, brazil or other woods, French berries, &c, for making lake, brown pink, Prussian blue, and many other pigments. It is requisite that this metal should be used for it, because

cause iron and copper, as they will necessarily be corroded in a greater or less degree by the saline substances requisite to be used for making several sorts, are extremely injurious to the colours; and should, therefore, never be suffered to approach the finer kinds.

The form of this boiler may be cylindrical, with a bottom making a section of a sphere. Its dimensions may be three feet in depth, and one diameter: but this may be varied, as the quantities of colours proposed to be made may vary the occasion. At the height of about two feet, must be joined to it, a strong margin or rim, by which it may be hung in the furnace; and a little above, must be two bow handles opposite to each other, by which it may be lifted in and out of the furnace. The whole must be wrought strong; as there will be frequent occasion to move it, when containing a considerable quantity of fluid.

The furnace for this boiler must be constructed in the following manner.

A rim of iron, such as was before directed to be used for hanging the sand-pot, together with the other iron-work, must be first procured. The diameter of the boiler being taken, as also its depth below the rim by which it is to hang, the proceeding in the fabrication may be the same as that of the furnace for the sand-pot, till the iron rim is to be fixed; when the course of bricks, which is raised upon the rim in that kind of furnace, must be in this wholly omitted. It is not improper, however, to allow two inches
more

bloom or filtering paper : but care must be taken in the choice of it ; for it is difficult to find, in common stationers shops, such as will even moderately well answer the end.

For coarse colours, such as rose pink, flannel bags may be employed, for expedition. They should be made in the form of pudding bags ; and are called, when applied to this purpose in medicine, Hippocrates's sleeve. They should have proper frames for fixing them ; which may be made of three sticks or wooden rods, fixed together at such a distance, that the bag, being hung upon them by three loops fastned to it, may have its mouth or opening subtended to a due width for pouring in the matter to be filtered.

Long boards must be likewise provided for drying colours. They should be made of sound wood ; and very well plained, and it will be yet better, if the surface be made still smoother, by varnishing them with seed lac.

Chalk-stones are also proper on some occasions, for expedition, for the drying ultramarine, Prussian blue, washed okers, and several other kinds : but they must never be used for lake, carmine, or any colours made of vegetable matter ; for their alkaline quality of chalk may be very detrimental to such colours. Where Prussian blue is made in very great quantities, there is a particular apparatus used for drying it : but we shall speak of that in its proper place.

The levigation of colours, being of the most general use of any operation, is likewise required in many cases to be most perfectly performed; and, therefore, proper instruments subservient to it are extremely requisite. Hand-mills, and sometimes even horse-mills, are used for grosser sorts of pigments, or where very large quantities are to be dispatched: but, as they are to be had of the proper workmen, duly constructed, it is needless to describe them here. The muller and stone are generally useful; and should alone be depended on, at least for completing the levigation after the grinding them in the mills, whenever the colours are of any greater value or nicer use. Basons should likewise be provided for washing over the colours according to the manner below described.

SECTION III.

Of the general operations subservient to the making or preparing colours.

THE operations subservient to the making and preparing colours are sublimation,—calcination,—solution,—precipitation,—filtration,—and levigation.

As the practice of most of these operations is confined at present, in a great degree, to the purposes of chemistry; and therefore, very little under-

understood by any, except those who concern themselves in that art, I shall endeavour to explain them, as far as they relate to the preparation and treatment of colours; and to give such general directions for the performing them, as may take away the necessity of repeating, on every occasion, those particulars, which occur in almost all the processes that partake of the same nature: but with respect to such operations, as are more commonly known and practised, I shall only touch on them, in a more general way, without entering into minuter considerations regarding them.

Of sublimation.

Sublimation is the raising solid bodies in fumes, by means of heat: which fumes are afterwards collected by condensation, either in the upper part of the same vessel where they are raised, or in others properly adapted to it for that purpose.

The end of sublimation is, either to separate substances from each other in order to the purification of one of them, or to mix them more perfectly than can be effected, without subjecting them to such a degree of heat as will necessarily render them volatile.

The means are, to put the matter, whether simple or compound, into a proper vessel or sublimer, and there give it a due heat, by placing it in a sand-pot, or the cavity of some furnace where the naked fire is required: in
doing

doing which the following particulars are the most material objects of attention.

The first care must be to provide glasses of the kind above mentioned, p. 24, and of a due size, which must be regulated as was before mentioned by the quantity of matter to be sublimed, and by the dimensions of the sand-pot, or cavity of the furnace where they are to be used.

The sublimer used for making King's yellow, or for any other operation to be performed in a sand-pot, need no previous preparation. But those to be used for vermilion, which must be placed in the naked fire, should be first well coated with the fire-lute; and a rim of the same matter must be worked round the coat at about two thirds of the height of the sublimer, to support it in the iron ring when let down into the cavity of the furnace. This coat of lute should be laid on of such thickness, that it may be about half an inch thick when thoroughly dry: and, if it be laid on at several distances of time, so that the first covering of the glass may be pretty dry before the second be put on, it will be the better; but great care should be taken, that the whole be of sufficient dryness before the sublimer be let down into the furnace; and that the rim of lute fit well the iron rim; for otherwise ill success will most likely attend the process of the operation. In default of the fire-lute the following may be substituted in its place, for the coating sublimers; and is indeed, on account of its cheapness, most commonly used;

used ; though greatly inferior to the other with respect to the security of the glasses.

“ Take of Windsor loom, or, if very good,
“ common loom, fine sand, and dung of horses
“ which feed on hay, each equal parts. Tem-
“ per them, with water, or the blood of any
“ beast ; and beat them well together.”

In fixing the sublimers in the sand-pots, an inch and half, or two inches of sand, must be first put into the pot ; on which the sublimer must be gently set. The pot must then be filled with sand up to the brim ; and the matter to be sublimed must be put into the sublimer, through its neck or mouth ; which must be afterwards covered by a piece of tile, or flat glass, laid loosely upon it.

The sublimers used without a sand-pot must be fixed, in the cavity of the furnace, by letting them through the ring of iron on the top of the furnace, till they hang by the rim of lute. After which the joint formed by the rim and ring must be made good by pointing with the fire-lute ; which must, however, be of dryish consistence ; and used sparingly, lest it moisten the lute of which the rim is made, and, causing it to give way, occasion the sublimer to slip through, and fall into the furnace.

The sublimers being fixed the fire must be lighted ; but must be kept in a moderate degree till the lute be thoroughly baked ; when, being increased, the matter will rise in fumes ; and form itself, in a cake, on the upper part of the glass : and this may be urged forwards by
raising

raising the fire, as strongly as it will bear to be without forcing the fumes out of the mouth of the sublimer : which, if it appear to happen, must be remedied as quickly as possible by abating the heat ; but proper care must be taken, that the mouth of the glass or sublimer be not choaked up by the subliming matter ; for which reason, the tile, or piece of glass, which covers it, should be lifted up at proper intervals, and an opening made, with the end of a tobacco-pipe, into the cavity of the sublimer. On the neglect of this caution, the glasses are very liable to be burst, by the rarefaction of the fumes, on the fires burning briskly. When no more fumes arise, which may be known by the abatement of the heat in the upper part of the sublimer notwithstanding the fire be equally strong, the operation may be concluded to be completed ; and, the furnace being suffered to cool, the sublimer must be taken out, and broken ; and the cake of sublimed matter in the upper part of the glass collected : observing carefully, that it be kept free from the dross or caput mortuum left in the bottom.

Of calcination.

Calcination is the operating on substances, by means of heat, so as to produce some change either in their texture or colour.

Calcination is sometimes performed, by exposing substances to the fire with as great extent of surface as possible : as in the case of

D

lead

lead for converting it into the red lead or minium, and antimony to prepare it for its conversion into glass: in other cases, it is performed, by putting the substances into a crucible, or other such vessel, in a more collected body; and surrounding the vessel with fire: and there is a case indeed, *viz.* that of the masticot, where bringing it near the fire will be sufficient.

The red lead, red oker, and antimony for making the glass, being calcined in large quantities by those, who make it their sole business, and have large furnaces like ovens constructed for these particular purposes, I shall be less explicit with regard to them; as it will be scarcely worth while for any, but those who carry it on as a gross manufacture, to concern themselves with them, unless as a speculative experiment.

The calcination of other substances for the preparation of colours may be performed, by putting the matter into a crucible, and placing it in a common fire; or, where greater heat or room is required, in the wind-furnace described p. 22 where the fire must be raised round it; and continued of such a degree, and for such a duration, as the occasion may make necessary.

This may be understood to be all that is requisite, where calcination is ordered, in the processes below given, without any particular direction for the manner of performing it: but where such direction is needful, it will be found to be inserted as each occasion occurs.

Of

Of solution.

By solution is meant, the reducing any solid body to a liquid state by means of another, into which, being put, it is melted or converted itself also into a state of fluidity.

This is performed, by the simply putting one body to the other and mixing them well together, except in some cases, where heat is necessary to expedite the effect.

When therefore bodies are ordered, in the processes below given, to be dissolved in others, it is only to be understood, that they are to be put together, and stirred, or shaken, at proper intervals, till the solid body be melted : and where that appears to proceed too slowly, the vessel must be put into a proper heat to accelerate the operation : but this heat should be always understood to be less than will make water boil, except where the contrary be expressly directed.

Of precipitation.

Precipitation is the re-separating a solid body, from any fluid one in which it is dissolved or melted, by the addition of a third body, which is capable of producing that effect. As, for example, if seed-lac be dissolved in spirit of wine, and water be added, the seed-lac will be precipitated, that is separated from the spirit in which it was dissolved, and reduced to the

state of an impalpable powder, which will subside to the bottom of the vessel containing the mixture.

The means of precipitation are therefore equally simple with those of solution: there being nothing more required, than to put the matter, which is to suffer the precipitation, into a proper vessel; and to add that which is to cause it; and when the effect is produced, to separate the fluid from the solid body precipitated, by pouring off what can be so parted from it; and draining off the rest in a filter.

Of filtration.

Filtration, though a very simple operation yet when it is required to be done through paper, and great quantities of fluid are to be filtered, demands some nicety and judgment in the management of it; otherwise accidents are very liable to happen, which retard greatly the work; and occasion frequently great delay and trouble; especially with those who are unpractised in it.

As the end of filtration is of two kinds, the one to free fluids from any solid bodies of a feculent nature with which they are mixed, the other to separate any precipitated powder, or other solid body, from superfluous fluid, the means must be varied. In the first case, paper, if it be of a right kind, is sufficient; in the other case, a coarse linnen cloth must be put
over

over the paper; otherwise, in taking the filtered matter out of it, parts of the paper will unavoidably mix themselves with it, and irremediably foul it.

Where filtering through paper is necessary, the pewter cullenders described p.24. will be found extremely commodious: but great care must be taken to accommodate rightly the paper to the cullender, as well as to pour the matter very slowly into it at first, till it be well settled, for on neglect of this caution, the paper will be very apt to burst; and delay the operation, by fouling the vessels with the unfiltered matter. If, as frequently happens, the paper, which is procured, prove of a bad texture, and want tenacity to bear the weight of the fluid poured into it, or when the fluid itself may be of a very relaxing nature, and weaken the paper, a coarse linnen cloth should be always used with the paper, whatever the intention of the filtering may be. For, though the fluid will pass faster through paper alone, yet much time will be saved from adding the linnen, by preventing the troublesome accidents that will else unavoidably occur.

In filtering large quantities, it will be frequently found, that, after the paper has been for some time soaked in the wet, the operation will proceed very slowly; the swelling of the substance of the paper, as well as the foulness of the fluid, diminishing, and at last choaking up, the percolating pores of the paper. When

this is the case, the paper should be always changed as soon it is perceived, that the filter ceases to run moderately: for, otherwise, the operation becomes intolerably tedious.

Where great quantities of more ordinary colours are made, such as rose pink, the kind of Prussian blue used for paper-hangings, or other such grosser kinds, the flannel bags mentioned p. 28 may be used; as the filtering such great quantities of fluid through paper would be an almost endless labour. In doing this, nothing more is required than to hang the bags on the frames by their loops; and to feed them with the matter to be filtered: only the first quantity which runs through; being apt to be foul, must be returned into the bag, till it be perceived that the fluid come clear.

Of evaporation.

Evaporation, or the reducing moist bodies dryness by an artificial heat, where it is not required to be in balneo mariæ, may be performed by boiling in any commodious vessel, till the matter be freed from all humidity; the vessel being fed with a fresh supply as the fluid appears to be diminished: but in the case of vegetable or animal substances, where they are to be evaporated to dryness, or a thick consistence, as in the artificial gall-stones, lake or brown pink, it ought to be performed in balneo mariæ; that is, by putting the vessel containing

taining the matter into another filled with water, and kept of a boiling heat : for, by this means, the substances are prevented from burning to the vessel as they grow dry ; which would otherwise unavoidably happen.

The evaporation in *balneo mariæ* may be commodiously performed in the vessels I have described p. 27, by fixing the tin boiler in the furnace, and hanging the pewter vessel in it by the rim ; the remaining cavity of the tin boiler, being filled with water, and made to boil till the matter be brought to a proper dryness or consistence. - This is all that is requisite where the quantity of matter remaining after the evaporation is large ; but, where it is small it is better to use some smaller vessel ; as it would be so diffused on the sides and bottom of the pewter one as would render it difficult to be collected. The best expedient for this, is to use a China basin of a proper size ; and to hang it, by packthread, to two sticks laid across the edge of the boiler, and fixed, at a proper distance from each other, by two other sticks tyed to them crossway : by which little machine, the basin may be suspended in the boiling water ; and, being fed with the fluid to be evaporated as proper room appears in it for a fresh supply, will perform the office extremely well. But where the quantity of fluid to be evaporated is great, though the remaining matter when dry be small, a previous evaporation, by the naked fire, may be used till the quantity be properly reduced ; taking care,

that the matter do not acquire so thick a consistence, as may subject it to burn to the sides or bottom of the boiler.

Of levigation, and washing over.

Levigation of colours, where great quantities are in question, is performed in hand and horse-mills: but this fails to produce so perfect an effect, as the muller and stone, which is used in all other cases: the assistance of a pestle and mortar being indeed taken in the case of glass, and hard bodies, to prepare them for the mills or stone.

The method of using these several kinds of instruments, as well as the constructure of the instruments themselves, are so well known, that it is needless to dwell on any particulars regarding them: but the other method subservient to the intention of levigation, (that is to say to the reducing pigments to a due degree of fineness as powders) called *washing over*, being less generally understood, and yet of the greatest utility for procuring many colours in the most perfect state, I will explain fully the manner of performing it; which is as follows.

“ The matter intended to be brought, by
 “ this operation, to an impalpable fineness,
 “ being first well levigated, or, if it be a body
 “ of a chalky texture as the okers, broken to
 “ a gross powder by pounding, let it be put
 “ into a deep basin almost full of very clean
 “ water;

“ water ; and there well stirred about : then,
 “ having rested a short time, that the grosser
 “ parts may sink to the bottom, let the water,
 “ together with the finer parts yet suspended
 “ in it, be poured off into another basin of
 “ the same kind ; and suffered to stand at rest
 “ till the powder has totally subsided, and left
 “ the water clear. Let as much of this wa-
 “ ter, as can without disturbing the sediment,
 “ be then poured back into the first basin ; and
 “ let the stirring, decantation, &c. be repeated
 “ as before, as often as shall be found neces-
 “ sary to separate all the powder that is of suf-
 “ ficient fineness. The remaining grosser part
 “ may be then again ground ; and the same
 “ treatment continued, till the whole of the
 “ matter be obtained in that state. This opera-
 “ tion is, however, in some cases, to be re-
 “ peated several times before the colour can
 “ be rendered so perfectly fine as may be
 “ wished : but when it is duly executed, pig-
 “ ments may be reduced to the most impal-
 “ pable powders, with great ease, even though,
 “ like vermilion, of the most obdurate tex-
 “ ture : and the okers, or any such bodies of
 “ a chalky or clayey texture, which grow soft
 “ in water, may be freed from sand, stones, or
 “ other impurities, and rendered of the highest
 “ degree of fineness, even without any previ-
 “ ous grinding. Where great quantities of
 “ matter are to be washed over, as in the case
 “ of okers, common Indian red, &c. tubs must
 “ be had to supply the place of basins ; and
 “ lading

“ lading with a bowl-dish must be used instead
 “ of decantation or pouring off.”

SECTION IV.

Of the nature and preparation of particular colours.

CLASS I. Of red colours.

Of vermilion.

VERMILION is a bright scarlet pigment, formed of common sulphur and quicksilver, by a chemical process: it is one of the most useful colours in every kind of painting; except enamel or glass; as it is of moderate price, spends to great advantage in any kind of work, and stands or holds its colour extremely well. It may be prepared in great perfection by the following process.

“ Take of quicksilver eighteen pounds, of
 “ flowers of sulphur six pounds: melt the sulphur in an earthen pot; and pour in the
 “ quicksilver gradually, being also gently
 “ warmed; and stir them well together, with
 “ the small end of a tobacco-pipe: but, if
 “ from the effervescence, on adding the latter quantities of the quicksilver, they take
 “ fire, extinguish it by throwing a wet cloth
 “ (which should be had ready) over the vessel.
 “ fel.

“ fel. When the mass is cold, powder it, so
 “ that the several parts may be well mixed to-
 “ gether ; but it is not necessary to reduce it
 “ by nicer levigation, to an impalpable state :
 “ having then prepared an oblong glass body,
 “ or sublimer, by coating it well with fire-lute
 “ over the whole surface of the glass, and work-
 “ ing a proper rim of the same round it, by
 “ which it may be hung in the furnace in such
 “ a manner that one half of it may be exposed
 “ to the fire in the cavity of it, fix it in a pro-
 “ per furnace ; and let the powdered mass be
 “ put into it, so as to nearly fill the part that
 “ is within the furnace : and, a piece of broken
 “ tile being laid over the mouth of the glass,
 “ sublime then the contents, with as strong a
 “ heat as may be used without blowing the
 “ fumes of the vermilion out of the mouth of
 “ the sublimer. When the sublimation is over,
 “ which may be perceived by the abatement
 “ of the heat towards the top of the body,
 “ discontinue the fire ; and, when the body is
 “ cold, take it out of the furnace ; and break
 “ it : and, having collected all the parts of the
 “ sublimed cake, separating from them any
 “ dross that may have been left at the bottom
 “ of the body, as also any lighter substance
 “ than may have formed in the neck, and ap-
 “ pears to be dissimilar to the rest, levigate the
 “ more perfect part ; and, when reduced to a
 “ fine powder, it will be vermilion proper for
 “ use.

Where

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Where great quantities of vermilion are manufactured, it is a practice, for the sake of cheapness, and to save the labour of coating, with so much care, glass sublimers with lute, to have earthen ones made of the same sort of clay as that employed for long necks. When this is done, these sublimers should be of a spheroidal figure, and about an inch less in their least diameter than the ring of the furnace in which they are to be hung; they must also have a rim worked at about two thirds of this height, of the same matter they are made of, by which they may hang in the iron ring, as the glass sublimers, by means of the rim of lute. It is much the best way, however, to give them a coat of good common loam, sand and horse dung.

The perfection of vermilion is to be of a very bright colour, and of a great degree of fineness, and that is most esteemed, which most inclines to a crimson hue: these appearances, besides the rendering it more advantageous for the purposes to which it is employed in painting, are the readiest proofs of its being unsophisticate.

Vermilion, when pure, will stand for any length of time, whatever vehicle it be used with; and may, therefore, be depended upon, for carnations, or the nicest purposes.

It is very usual, I might almost say general, for dealers to sophisticate vermilion with red lead: which renders it very liable to change, and lose its brightness; as the red lead is apt to turn black, whether used with oil, or water.

This

This adulteration, when made in a greater degree, may be perceived by the difference in colour betwixt the sophisticated and pure; for the red lead, being considerably more of the orange hue than the vermilion, renders it less crimson. But to detect the fraud of mixing red lead with the vermilion with certainty, both with respect to the general fact, and the proportion, the following means may be used.

“ Take a small, but known quantity of the
 “ vermilion suspected to be adulterated, and
 “ put it into a crucible; having first mixt
 “ with it about the same quantity, in bulk, of
 “ charcoal dust: put the crucible into a com-
 “ mon fire, having first covered it with a lesser
 “ crucible inverted into it; and give a heat suf-
 “ ficient to fuse lead; when the crucible, be-
 “ ing taken out of the fire, should be well
 “ shaken, by striking it against the ground. If
 “ the suspected adulteration have been practised,
 “ the lead will be found reduced to its metal-
 “ line state, in the bottom of the crucible; and,
 “ being weighed, and compared with the
 “ quantity of cinnabar that was put into the
 “ crucible, the proportion of the adulteration
 “ may be thence certainly known: but, if no
 “ lead be found in the crucible, it may be safely
 “ inferred, that no red lead had been commixt
 “ with the cinnabar.”

It is very necessary, that vermilion should be extremely well levigated: as it both contributes to its brightness and spending further in the work: and this can scarcely be effectuated

by mills without the subsequent use of the mullar and stone; though it has been usual for preparers to pass it off as it comes out of the mill; but whoever would have vermilion in perfection, especially for painting carnations or mixing with white, should improve its fineness by washing over.

Of native cinnabar.

Native cinnabar is a pigment compounded of quicksilver and sulphur; and therefore differs in nothing from vermilion but in the manner of its production, and the being sometimes of a more crimson colour. It is found naturally formed in the earth in many places; but seldom so pure as to be fit for the uses of painting, at least without being purified by sublimation; which operation, being probably not well known to those who have any concern in the finding it, has not been hitherto practised, as far as appears. On this account native cinnabar has as yet been scarce and dear: a great part of what has been sold as such, having been factitious: but the crimson colour of some quantities, and the mistaken notion that it would stand better than vermilion, because it was a natural production, have made it to be coveted by painters who are curious in colours. It is however never worth their while to be solicitous about it, as it seldom excels the best vermilion in brightness; and as that may be likewise rendered equally crimson, if the proportion of sulphur be made only as one to six
or

or seven of the quicksilver : and as, if there really was any superiority, with regard to standing, in the native cinnabar over the other, they never could be certain of having it genuine.

When native cinnabar is used as a colour, there is no other preparation necessary than a careful levigation ; which may be best performed, with water, on the stone : but whoever would have it in the most perfect state must superadd washing over to the grinding. It has been usual to wash this colour as well as vermilion in urine, juice of lemon, and other fluid substances ; but there is not the least alteration to be made in it, by any such means, if it be pure, for the reason before given with respect to vermilion.

Of red lead or minium.

Red lead is lead calcined, till it acquire a proper degree of colour, by exposing it with a large surface to the fire.

The bright orange colour of red lead might render it valuable in painting, if it would stand with certainty in either oil or water : but it is so subject to turn black when used with oil, and even sometimes with water, that it is by no means fit to be trusted either alone or mixed with any other colours where the standing well is of consequence ; except in hard varnishes, indeed, which, locking up the pigments from the air and moisture, renders their colour durable in almost

almost all instances. For this reason red lead is seldom now employed in oil, nor very frequently in water, but for very gross purposes, or to make a ground for vermilion; which being slightly spread upon it will go much farther than on any other ground: but even this is not advisable where it is desired the colour should stand for a long time.

The goodness of red lead may be distinguished by the brightness of its colour; for whatever it is adulterated with will of course diminish it: and it is on this account, not so liable to be sophisticated, as white lead, vermilion, and some other pigments. The adulteration, however, where any is suspected, may be easily detected by the following means.

“ Put an ounce of what is suspected into a
 “ crucible, with an equal bulk of charcoal
 “ dust; mixing them well together. Place
 “ the crucible in a common fire sufficiently
 “ hot to melt lead; covering it with another
 “ smaller crucible inverted into it. Continue
 “ it in the fire for some time; and then take
 “ it out; and strike it against the ground.
 “ The red lead will then be reduced to its metallic state; and, being poured out, and freed
 “ from the charcoal dust, may be weighed
 “ when cold and will shew by its deficiency
 “ the proportion of adulterating matter.”

Of scarlet oker.

Scarlet oker, is the ochrous earth, or rather iron, which is the basis of green vitriol, separated from the acid of the vitriol, by calcination. It is of a broken orange scarlet colour: but, for its great certainty of standing, in which it equals any of the native okers, and its extreme great strength and warmth either as a ground or in the shades of carnations, it is nevertheless very valuable. It may be used as a colour in any kind of painting; (but in enamel it turns to a transparent yellow like brown pink, if the flux be strong): and is easily prepared in the following manner.

“ Take, of green vitriol or copperas, any
 “ quantity: and being put into a crucible, of
 “ which it will fill two thirds, set it on a
 “ common fire to boil, (taking care that it do
 “ not boil over,) till the matter be nearly
 “ dry; when it will be greatly diminished.
 “ Fill then the crucible to the same height a-
 “ gain, and repeat this, till the crucible be
 “ filled with dry matter. Take it then from
 “ this fire, and put it into the wind-furnace;
 “ or, if the quantity be small, it may be con-
 “ tinued in the same fire, the coals being
 “ heaped up round it; and let the contents be
 “ calcined there till they become of a red co-
 “ lour when cold; which must be examined
 “ by taking a little of the matter out of the
 “ middle, and suffering it to cool: for so
 “ long as it remains hot the red colour will
 E “ not

“ not appear, though it be sufficiently calcined.
 “ When duly calcined take the oker out of
 “ the crucible while hot, and put it into wa-
 “ ter, in which the parts of the broken cru-
 “ cible may be soaked likewise to obtain more
 “ easily what shall adhere to them ; and stir
 “ the oker well about in the water, that all
 “ the remaining vitriol may be melted out of
 “ it. Let it then settle, and when the water
 “ appears clear, pour it off, and add a fresh
 “ quantity ; taking out all the broken pieces
 “ of the crucible ; and proceed as before ;
 “ repeating several times this treatment with
 “ fresh quantities of water. Then purify the
 “ oker from any remaining foulness by wash-
 “ ing over ; and, having brought it to a pro-
 “ per state of dryness, by draining off the fluid
 “ by a filter, in doing which the paper used
 “ must be covered with a linnen cloth, lay
 “ it to dry on boards.”

Common Indian red.

The common Indian red, meant here, is of an
 hue verging to the scarlet : but the true Indian
 red, (of which I shall speak below) is greatly
 inclining to the purple : among which colours
 it may be well classed.

This common kind has been introduced as a
 counterfeit or substitute for the real kind brought
 from the East-Indies : and has, by its cheap-
 ness and serving equally well for common pur-
 poses, prevented that from being brought over
 for

for a long time. So that the true teint of the original kind, being in some measure forgotten, this has been gradually made to vary from it, till it is in fact a quite different colour. But though the common Indian red will not answer the ends of the true kind, it is yet a very useful colour for many other purposes : and is, therefore, on account of its standing and warm though not bright colour, much used as well in finer as coarser paintings in oil. As it is made of the caput mortuum of vitriol after the distillation of aqua fortis and oil of vitriol, it is afforded at a very moderate price, and may be thus managed.

“ Take, of the caput mortuum or oker left
 “ in the iron pots after the distillation of aqua
 “ fortis from nitre and vitriol, two parts, and of
 “ the caput mortuum or colcothar left in the
 “ long necks after the distillation of oil of vi-
 “ triol one part; break the lumps found among
 “ them and put them into tubs with a good
 “ quantity of water; and, having let them
 “ stand for a day or two, frequently stirring
 “ them well about, lade off as much water as
 “ can be got clear from them; and add a fresh
 “ quantity; repeating the same treatment till
 “ all the salts be washed out, and the water
 “ come off nearly insipid. The red powder
 “ which remains must then be washed over, and
 “ being freed from the water laid out to dry.
 “ When this is designed for nicer purposes,
 “ it should be washed over again in basons,
 “ the gross manner of lading it out of one tub

“ into another not fitting it always completely
 “ to such ends.”

Of Venetian red.

Venetian red is a native red oker, rather inclining to the scarlet than the crimson hue : it is not far different from the common Indian red, but fouler ; and may, therefore, be easily prepared from mixing common red oker with the colcothar or caput mortuum taken out of the aqua fortis pots, and washed over.

As it is generally used by house-painters in imitations of mahogany, it requires no other preparation than to be well ground with the oil with which it is used ; but when, as is sometimes the case, it is used in miniature painting, it should be carefully washed over.

Spanish brown.

Spanish brown, or brown red, is a native earth, found in the state, and of the colour in which it is used : it is nearly of the same colour with the Venetian red, but fouler. It was probably from its name brought originally from abroad, and was then most likely of a finer kind : but what is now used is the produce of our own country, being dug up in several parts of England.

It is used for grounds and primings for coarse work by house-painters ; and by colourmen in the preparation of the cloths for pictures and other
 coarse

coarse work : but seldom in any more delicate paintings. It therefore needs no other preparation than freeing it well from stones and filth : tho' if any who may be desirous to use it for nicer purposes, want to have it in a more perfect state, they may make it equal, in fineness and purity to any other pigments whatever, by washing over : and, if they can render it useful to them with regard to the colour, they may depend on its standing equally with any other pigment whatever ; being a native ochrous earth, of which kind none are ever known to fail, whether they be used of their natural teint, or changed by calcination.

Of calcined or burnt terra de Siena.

The terra de Siena is a native oker brought hither from Italy in the state it is naturally found : it is yellow originally ; (of its qualities in which state we shall treat in its proper place below ;) but when moderately calcined, it becomes an orange red, though not very bright. Being, however, semi-transparent in oil, it is of great use where a strong brown red shade is wanted ; as in the face in portraill painting, and on many other occasions.

The calcination may be performed by putting lumps of it, either in a crucible, or naked, in a common fire : and continuing it there, till the colour be changed from yellow to red in the proportion wanted ; after which, it must be well levigated and washed over.

With respect to the goodness of terra de Siena, we have but one kind brought here ; and whoever can obtain it crude, in the unburnt lumps, may be certain it is not adulterated.

Of carmine.

Carmine is a bright crimson colour, and is formed of the tinging substance of cochineal brightened with aqua fortis, by a process similar to that used for dying scarlet in grain. It is of great advantage in painting as well in water as varnish, both on account of its beauty and standing well ; but it will not mix with oil so as to have the due effect in that kind of painting.

The preparation of this colour in perfection is kept a secret in France, where the best is prepared : for though some is made here of good hue and brightness before it be used, yet it flies on its commixture with white ; and turns purple even with the sweat of the skin, if rubbed on the hands or face. The superiority of the French carmine, as well as of the scarlet dye, has been attributed to some qualities in the air and water of France ; but nothing is more absurd than this supposition, as the air has very little concern in the production of carmine ; and the qualities of the water if different might be artificially changed. But the difference itself betwixt the English and French carmine, which does not lie in the beauty of the colour,

lour, but in its durableness and fixt nature, clearly evinces a diversity in the preparation ; and leaves no room to doubt, but that the carmine might be equally well made in this country, if we were thoroughly masters of the art ; and a considerable saving thence gained to the public ; as at present we buy of France the far greatest part of what is consumed ; which is more than can be easily imagined, till we recollect, how frequent the use of red is grown among the English ladies ; and that this is almost the only substance used in this country as a red paint for living faces.

The compilers of the new French Cyclopaedia have given two or three old recipes for the preparation of this colour ; and afterwards recommended another, as preferable to them taken from Kunckel ; which on examination is only a process for making bad lake of scarlet rags : but rather than to insert such imperfect instructions for the making an article of great consequence, as may delude those, who are earnest in their pursuit of this art into a fruitless expence of time and money, I chuse to be silent, and acknowledge my own ignorance in this particular, instead of leading them into an error by groundless pretensions to the contrary.

Of lake.

Lake is a white earthy body, as scuttle-fish-bone, the basis of alum, or chalk, tinged with

some crimson vegetable dye, such as is obtained from cochineel, or Brasil wood dissolved or taken up by means of some alkaline salt, and precipitated on the earth by the addition of some acid.

Lake is used in all kinds of painting (except enamel :) but particularly in oil; where it supplies the place of carmine, which does not at all agree with that vehicle. It is valuable both for its brightness and crimson teint; which make it useful for carnations to the portrait painters; for skies to the landkip or ship painters; and for flowers to those who paint still life. Its transparency in oil renders it also of great service in glazing, as it is called, over vermilion; and in painting scarlet draperies, and the red parts of the lips: and its acquiring a dark hue, by this transparency, when used without the addition of any opaque pigment, gives it an unrivalled excellence in the shades of red draperies, or other similar cases. Notwithstanding these meritorious qualities, lake is not at present universally approved: nor without reason; for there is a defect, which makes it to be frequently rejected where its use can be avoided. This defect is the uncertainty of its standing, when prepared in that manner which most conduces to its perfection in other respects. For though some parcels will hold their colour intirely well, yet others prepared in the same manner, as far as art can assure it, will fly in a degree that makes the use of it destructive to any painting; and if this defect be effectually remedied,

remedied, as it may be by securing the tinging particles by gums, from all attacks of the air ; yet that is generally at the expence of the brightness and transparency: the earth, which is the basis of the pigment, being locked up by the gums, and rendered incapable of being combined intimately with, or imbibing the oil. Besides the perfections of lake which it may have in common with other colours, there is yet another that relates only to itself, which is the inclining to the scarlet hue that makes it more valuable for almost all the purposes to which it is applied : and where this quality joined to the others happen to be found in it, there is scarcely any limits to be set to its value with eminent painters of any kind : as was shewn in the instance of a parcel made by an unknown person, supposed to be a member of the Royal Society, and vended by one Stocks, then a colourman in Newgate-Street, which was afterwards sold by some of those who purchased it of him at two guineas *per* ounce.

Lake was most probably first made from the colour found in the grains of the stick-lac, from whence it seems to have taken its name : but it may be made from a great variety of substances which afford a crimson tinge ; tho' at present it is seldom prepared from any other than cochineel, scarlet rags, and Brasil wood.

The best of what is commonly sold is made from the colour extracted from scarlet rags and deposited on the cuttle-bone, which may be done in the following manner.

“ Take

" Take a pound of the best pearl-ashes,
 " and, having dissolved them in two quarts
 " of water, purify them by filtering through
 " paper. Add then to this solution two more
 " quarts of water, and having put in a pound
 " of scarlet shreds, procured of the tailors,
 " (for they must be intirely clean) boil them
 " in the pewter boiler described p. 24, till the
 " shreds appear to have wholly lost their scar-
 " let colour. Take them out of the solution
 " and press them well; dipping them after in
 " water and pressing them again, that all the
 " fluid they had imbibed may be got from
 " them, which must be put back to the rest.
 " Take then another pound of the scarlet
 " shreds, and repeat the like treatment of them
 " in the same solution; as also a third and
 " fourth pound. While this is doing dissolve
 " a pound and half of cuttle-fish in a pound
 " of strong aqua fortis in a glass receiver, add-
 " ing more of the bone, if it appear to pro-
 " duce any ebullition in the aqua fortis: and,
 " having strained off this solution through flannel,
 " pour it into the other by degrees: ob-
 " serving whether it produce any effervescence
 " on putting in the last quantity: which, if it
 " do, in any great degree, more of the cuttle-
 " fish-bone must be dissolved in aqua fortis;
 " and the solution very gradually added till no
 " ebullition appear to be raised by it in the
 " mixture. If this be properly managed the
 " fluid will soon become clear and colourless,
 " and the tinging particles extracted from the
 " shreds

“ shreds together with the cuttle-fish-bone,
 “ will subside to the bottom, and form a crim-
 “ son sediment; which is the lake. The wa-
 “ ter must then be poured off; and two gal-
 “ lons of hard spring water must be put to
 “ the lake, and well stirred about to mix
 “ them: which, being likewise poured off,
 “ after the lake has again settled to the
 “ bottom, must be replaced by another two
 “ gallons; and the same method must be re-
 “ peated four or five times: but if hard water
 “ cannot be procured, or the lake appear too
 “ purple, half an ounce of alum should be
 “ added to each quantity of water before it
 “ be used. When the lake is thus sufficiently
 “ freed from the salts, it must have the water
 “ drained from it in a filter covered with a lin-
 “ nen cloth, which has been so worn as to
 “ have no knap or down remaining on its sur-
 “ face. After the lake has drained to a pro-
 “ per dryness, it must be dropped, on clean
 “ boards, by means of sticks of elder, moun-
 “ tain-ash, or other hollow wood, cut into the
 “ form of pens; and suffered to dry: when
 “ the drops will appear in the form of little
 “ cones or pyramids.”

If this lake be of a deeper colour than be
 desired, the proportion of scarlet shreds may
 be diminished: or if it be wanted yet deeper,
 they may be increased.

This lake, when the process succeeds well,
 will be very bright: and will stand equally to
 any whatever: but it is not so transparent and
 fit

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fit for glazing as that where earth of alum is the basis.

Lake may be prepared from cochineel in the following manner.

“ Take two ounces of cochineel, and infuse
“ it in a gallon of stale but very clean urine
“ for several days. Take also half an ounce of
“ the best annatto and dissolve it in a solution
“ of two ounces of pearl-ashes in a pint of wa-
“ ter ; filter both the solutions and mix them.
“ Make then a solution of cuttle-fish-bone as
“ in the above process ; and to a pint of it add
“ two ounces of alum dissolved in half a pint of
“ water. Put this mixture gradually to that
“ of the urine and pearl-ashes, as long as any
“ ebullition appear to arise ; and proceed as to
“ the rest according to directions of the above
“ process.”

This lake will be very fine if luckily managed, and will stand extremely well : it will also be very scarlet if the cochineal and annatto be good.

Preparation of beautiful lake from Brazil wood.

“ Take of Brazil wood (not coloured in
“ the grinding by the addition of pearl-ashes)
“ three pounds, and boil it an hour in a solu-
“ tion of three pounds of common salt in
“ three gallons of water : and then filter the
“ fluid through paper while hot ; prepare then
“ a solution of five pounds of alum in three
“ gallons of water ; which add to the fil-
“ tered

“tered solution of common salt tinged with
 “the colour. Make also a solution of three
 “pounds of the best pearl-ashes in a gallon
 “and half of water, and purify it by filtering:
 “put this to the other gradually, till the whole
 “of the colour appear to be precipitated, and
 “leave the fluid clear and colourless: but, if
 “any appearance of purple be seen, add a
 “fresh quantity of the solution of alum by
 “degrees till a scarlet hue be produced. The
 “proportion of alum must however in this
 “case be nicely adjusted: for a small excess
 “will cause part of the tinging matter to be
 “dissolved again; which will appear by the
 “fluids being coloured: and, in such case, a
 “ballance must again be made, by the addi-
 “tion of a small quantity of the solution of
 “pearl-ashes. When the fluid is thus ren-
 “dered clear of colour, and the sediment, be-
 “ing subsided, appears of a crimson teint
 “tending to scarlet, the directions in the first
 “process must be followed in every point.”

This lake cannot be confided in for either
 painting in oil or water; but in varnish, or
 for any other purpose, where it is defended
 from air, it is superior to any other whatever,
 on account of its great brightness and trans-
 parency.

It may be rendered safe, however, with re-
 spect to standing, if half a pound of seed lac
 be added to the solution of pearl-ashes; and
 dissolved in it before its purification by the fil-
 ter: but, in this case, two pounds of the wood,
 and

and a proportionable quantity of the common salt and water, must be used in the coloured solution. This will produce a lake that will stand well in either oil or water ; and will sometimes be extremely beautiful ; but it is not so transparent in oil as without the feed-lac.

The lake with Brasil wood may be made, also, with the addition of half an ounce of annatto to each pound of the wood : which will render it much more scarlet where it is so wanted. But the annatto must be dissolved in the solution of pearl-ashes ; and not in that of the common salt along with wood.

The goodness of lake cannot be positively known but by the actual trial of it ; which, with respect to its standing, requires some time ; but its other qualities may be more easily judged of.

With respect to the brightness, its merit may be easily proved by grinding a little of it, on a pallet or stone, with white lead and oil ; where it may either be judged of by the memory of those who are very conversant in the use of it, or by comparing it with a sample of any other. In relation to the transparency, it is also easy to judge of it, by grinding a little, in the same manner, with oil only ; where a mud-diness will be perceived, if the lake be in the least opaque : or a little of it may be put, in this state, on the glass of a window ; where its thickness or clearness will of course be apparent to the minutest degree. This indeed is the only

only method used in general by colourmen for deciding on all the qualities of lake ; but it is very inconclusive with regard to any but transparency. In respect to the standing of lake, it is much more nice and difficult to determine: and indeed there can scarcely be any certainty about it but by actual experience. The colourmen having put a small quantity of any which they are desirous to try on a window, in the manner just before mentioned, let it stand there for some time, to see if the colour fly : and other persons think they have a more expeditious and certain though less known method, by trying it with the juice of lemon : which, if the juice turn the lake to an orange colour, or make any other change in it, gives a proof as they conclude of the badness, or of the contrary if no alteration be produced : but neither of these methods are infallible ; for it is practicable to prepare lake, which will undergo both these tests, and yet not stand well when used in a picture. Though the standing the juice of lemon is some presumption, that the lake will hold its colour ; and the being altered by it is a pretty certain proof of the contrary.

There is another defect, with respect to some purposes ; which is apt to be found in lake : it is the fatning in oil. This can only be known, by grinding some of it in the oil, and keeping it the proper time in bladders. When, if it be found to have this fault, it may be deemed utterly unfit for the use of colourmen. If, never-
theless

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theless it have no other bad qualities, it is not at all the worse for this, with regard to those who have no occasion to keep colours in bladders, but mix them as wanted on the pallet.

There is another kind of lake brought from China which is extremely beautiful; but as it will not mix well with either water or oil, tho' it dissolves intirely in spirit of wine, it is not of any use in our kinds of painting hitherto. This lake has, by some unaccountable blunder, got the name of safflower among those who paint in water: and has, indeed, been so called in more than one pamphlet written on the use of water colours. But there is not the least affinity betwixt it and the real safflower; which is the dried flowers of the carthamus or bastard saffron, and is a well known substance; as being a common dying drug.

Of rose lake, commonly rose pink.

Rose pink is a lake like the former; except, that the earth or basis of the pigment is principally chalk; and the tinging substance extracted from Brasil or Campeachy (commonly called Peachy) wood.

As it never can be expected to stand, when used with oil or water, it is seldom employed for any purposes but the coarse work of house painters, or for paper hangings; unless sometimes with varnish, where it is secured from flying, and, when beautiful, may be substituted for lake.

Rose

Rose pink may be prepared in the following manner.

“ Take Brazil wood six pounds, or three
“ pounds of Brazil and three of Peachy wood.
“ Boil them an hour with three gallons of wa-
“ ter, in which a quarter of a pound of alum is
“ dissolved. Purify then the fluid by straining
“ thro’ flannel; and put back the wood into the
“ boiler with the same quantity of alum, and
“ proceed as before; repeating this a third
“ time. Mix then the three quantities of tinc-
“ ture together; and evaporate them till only
“ two quarts of fluid remain; which evapora-
“ tion must be performed first in the pewter
“ boiler and afterwards in the *balneo mariæ*
“ described p. 27. Prepare in the mean time
“ eight pounds of chalk by washing over; a
“ pound of alum, being put into the water
“ used for that purpose, which after the chalk
“ is washed must be poured off and supplied
“ by a fresh quantity till the chalk be freed
“ from the salt formed by the alum: after
“ which it must be dried to the consistence
“ of stiff clay. The chalk, and tincture as a-
“ bove prepared, must be then well mixed to-
“ gether by grinding; and afterwards laid out
“ to dry where neither the sun or cold air can
“ reach it: though if it can be conveniently
“ done, a gentle heat may be used.”

The goodness of rose pink lies chiefly in the brightness of the colour and the fineness of its substance; which last quality depends on the washing well the chalk. The more

the hue of rose pink verges on the true crimson, that is to say, the less purple it is, the greater its value."

Red oker.

Red oker is a native earth : but what is commonly used is made red by calcination ; being when dug out of the earth yellow, and the same with the yellow oker commonly used. It is chiefly brought from Oxfordshire, where it is found in great plenty, and burnt in large ovens. The quality it has, in common with all other okers, of standing infallibly, renders it very useful, as well in the more delicate as coarser paintings in oil, notwithstanding it is not bright : but in order to its being fit for nicer purposes, it ought to be washed over ; though for others, it may be used in the state in which it is found in the shops.

The cheapness of red oker renders it scarcely worth while to adulterate it : but, either from such practices, or from the difference of their natural state, some parcels are greatly better than others. The marks of goodness are brightness of colour ; and the being of a crumbly chalky texture, shewing no gritty roughness when rubbed betwixt the fingers.

CLASS II. Of blue colours.

Of ultramarine.

ULTRAMARINE is a preparation of calcined lapis lazuli. It is, when perfect, an extreme bright blue colour, with a transparent effect in oil, and in some degree in water; and will stand, when used in painting, without the least hazard of flying, with whatever vehicle, or pigment, it be mixed. For these reasons, ultramarine is of the highest value in every kind of painting; being equally serviceable in all, even in enamel: and though the invention of Prussian blue, on account of its much lower price, has greatly lessened the use of it, yet this exclusion of it may be considered as an injury to painting in general; as the skies of landshapes, and many other parts of modern pictures, shew the loss of it, by their changing from a warm, or clear blue, to a faint greenish or olive teint.

There have been a great variety of methods taught, and practised, for preparing the ultramarine. The older methods were, after a calcination in a crucible, to mix a composition of pitch, resin, Burgundy pitch, sope, wax, and other ingredients; and to form a paste of them with the calcined matter; which paste was then put into water for several days; and afterwards dissolved, by successive quantities of warm water poured on it, till it let go the colour of the calcined ultramarine; which was

recovered by the same means as is directed for the washing over colours in p. 40. But this method of employing a variety of ingredients, in the cement, was not only unnecessary, but injurious to the colour ; which was never perfectly freed by the warm water from them : and for this reason, the methods have been continually varied by those, who have attempted to prepare this pigment. I shall however give the best of the more modern ; and subjoin one of older date ; which I believe, nevertheless, to be equally good, though not near so troublesome.

“ Take the lapis lazuli, and break it into
 “ very small pieces, or rather a gross powder.
 “ Put it into a crucible ; and cover it securely
 “ to prevent the coals from falling amongst it.
 “ Calcine it then, with a strong fire, for an hour
 “ if there be any large quantity, or less time
 “ in proportion ; and quench it, when taken
 “ out of the fire, in vinegar ; stirring them
 “ well together ; and suffer it to remain in that
 “ state for a day or two. Pour off then the
 “ vinegar ; except what may be necessary for
 “ moistning the calcined lapis lazuli in grind-
 “ ing ; which operation it must then undergo,
 “ in a mortar of flint or glass, till reduced to
 “ the greatest degree of fineness those means
 “ may effect ; but, if it appear yet too hard to
 “ be easily ground, give it another short calci-
 “ nation ; and quench it a second time in vine-
 “ gar. The vinegar must then be washed off
 “ from the powder, by the putting to it sever-
 “ al successive quantities of clean water ; each
 “ of

“ of which must be poured off when the lapis
“ lazuli has been well stirred about in them, and
“ is again settled to the bottom. It must then
“ be ground on a porphyry stone, with a mul-
“ ler, till it be perfectly impalpable; and then
“ dried : in which state it is duly prepared to
“ mix with the following cement. — Take
“ of Burgundy pitch, nine ounces, — of white
“ resin, — and Venice turpentine, six ounces, —
“ of virgin wax one ounce and half, — and of
“ linseed oil one ounce and a quarter. Mix them
“ together by melting in a pipkin over the fire ;
“ and suffer them to boil till they acquire so
“ stiff a consistence, that, being dropt into wa-
“ ter while of this boiling heat, they will not
“ spread on the surface of it, but form a
“ roundish mass or lumps. The cement be-
“ ing thus formed, may be poured out of the
“ pipkin into the water : and made into cakes
“ or rolls for use. Of this cement, take
“ an equal weight with that of the calcined
“ lapis lazuli ; and melt it in a glazed earthen
“ pipkin ; but not so as to render it too fluid.
“ Then add to it the calcined matter by very
“ slow degrees ; stirring them together with
“ an ivory spatula till the whole appear perfect-
“ ly mixed. Being thus mixed, heat the com-
“ position to a something greater degree, and
“ cast it into a large basin full of cold water :
“ and, when it has cooled to a consistence to
“ bear such treatment, knead it well like the
“ dough of bread, with the hands rubbed over
“ with linseed oil, till all the parts be tho-
“ roughly.

“ roughly incorporated with each other : then
“ make the mass into a cake ; which may be ei-
“ ther kept till some other convenient time in
“ cold water, or immediately proceeded with in
“ the following manner. Put the cake into an
“ earthen dish or basin ; the bottom of which
“ should be rubbed with linseed oil, and pour
“ on it water of the warmth of blood : let it
“ stand a quarter of an hour ; and, as the water
“ softens the cake, it will let loose the finest
“ part of the calcined matter : which, on
“ gently stirring the water, but without break-
“ ing the cake or separating it into lesser parts,
“ will be suspended in the water ; and must
“ be poured off with it into another vessel.
“ The quantity of water must be then re-
“ newed : and the same operation repeated a
“ second or third time : and, as the mass ap-
“ pears slack, in affording the colour, it must
“ be moved and stirred, in the manner of
“ kneading, with the ivory spatula, but not
“ broken into fragments or small parts : and,
“ when so much of the colour is extracted,
“ as to render it necessary for the obtaining
“ more, the heat of the water must be en-
“ creased to the greatest degree. The quan-
“ tities of the calcined matter, (which is now
“ the lapis lazuli,) that were first washed off,
“ and appear of the same degree of deepness
“ and brightness, may be put together : and
“ the same of those of the second degree ;
“ the last washings making a third. The water
“ being then poured off from each of these
“ parcels,

“ parcels, put on a lixivium formed of two
 “ ounces of salt of tartar, or pearl-ashes, dis-
 “ solved in a pint of water, and filtered thro’
 “ paper after the solution is cold: which
 “ lixivium must be put on boiling hot, and
 “ the lapis lazuli stirred well about in it;
 “ and then the mixture set to cool. The
 “ powder being subsided, the clear lixivium
 “ must be poured off, and clean water put in
 “ its place: which must be repeated till the
 “ whole of the salts of the lixivium are washed
 “ away. The lapis lazuli must afterwards be
 “ dried; and will be then duly prepared for
 “ use.”

“ Another method of purifying the ultra-
 “ marine from the cement may be used; which
 “ is, the pricking the yolks of eggs with a pin,
 “ and moistning the matter to be purified
 “ with the soft part that will run out, and
 “ working them together in a glass or flint
 “ mortar: after which the mixture must be
 “ put into the lixivium; and proceed with as
 “ is above directed.

“ In order to free the ultramarine from that
 “ part of the water, which cannot be poured
 “ off from it without carrying away part of
 “ the powder, let it be put in a deep pot, such
 “ as the cups made for coffee; and, after the
 “ whole is poured off that can be without loss,
 “ set the pot so on a table or stand, that strings
 “ put into it may hang below the bottom;
 “ and then take three or four thick threads of
 “ loose twisted cotton; and, having wet them,
 F 4 “ put

“ put one end of each into the fluid ; and let
 “ the other, being brought over the edge of
 “ the pot, hang three or four inches below the
 “ bottom of it : by which means, the water,
 “ being attracted by the threads, will drop
 “ from the lower end till the whole be nearly
 “ drained away. The matter may then be
 “ poured upon a porphyry, or polished marble ; and suffered to dry.”

The other method, I have proposed to give, differs, from the above, only in the using virgins wax and the best white resin, melted together in equal quantities, instead of the more compound cement : and this gives up the colour, on its being infused in warm water, much sooner than the other.

The other methods of preparing ultramarine differ chiefly in the manner of separating the colour from the cement and feculencies : which some recommend to be done, by squeezing and working the mass with the hand in warm water, after it has lain in it some time to soften. Others advise the putting the mass in the form of a flat cake, on a board, in a situation somewhat declining from an horizontal position, and making water drop on the board above the cake, that it may flow through it, and wash out the ultramarine : to facilitate which, the parts of the cake must be frequently opened and stirred with a stick. But this method is more troublesome and less efficacious than that above given.

Ultramarine may be also prepared, without
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any cement, by calcining it ; and, when levigated and washed over, soaking it in distilled vinegar made hot. The ultramarine will, in this way of preparation, be produced in greater quantity ; but it will be lighter coloured than when refined by the cement. It is, however, a very good method of preparing it for the skies, and some other uses.

As it is of the last consequence to the producing fine ultramarine, that the lapis lazuli, of which it is made, should be good, it may be judged of by inspection from the deepness and clearness of its blue colour ; and in order to be more certain of its value, it is proper to heat a small piece red hot ; which, if it retain afterwards its hardness and colour, may be accounted good, but if it become crumbly and turn brown, or appear to have specks of dulness, it may then be justly suspected, or rather condemned.

The different parcels of ultramarine produced from the same parcel of lapis lazuli, according to the above process, will differ greatly in their value : the manner of judging of which must be by the degree of brightness and deepness of the colour ; but there is no being precisely certain of the worth of any but by comparing it with a specimen of known value ; and to do that with great accuracy, a little of each should be thinly rubbed on white paper, or mixed with white flake and oil, by means of a pallet knife, so as to form light tints of the same degree ; where the brightness will shew itself more distinguishably than in darker.

Of

Of ultramarine ashes.

The pigment called ultramarine ashes is the residuum or remains of the lapis lazuli after the ultramarine has been extracted from it by the above given, or any similar process. But as the coloured particles which remain are mixt with those of another kind contained in the lapis lazuli, whether earths or metalline substances, these ashes must of course be much less valuable than even the worst ultramarine: sometimes, nevertheless, when the operation of the extracting the colour from the calcined lapis lazuli has not succeeded well, a considerable share of the ultramarine is left behind with the recement, and greatly enhances the worth of the ashes: and indeed, as it is certain, that what colour they possess when genuine will never fly, they always bear a good price. The appearance of these ashes is that of ultramarine a little tinged with red, and mixed with white: but they are frequently adulterated; and made by the sophistication to look better than they would in a genuine state. This adulteration renders them much less certain of standing, if, as is most frequently the case, it be made by precipitated copper, in the manner before mentioned in the case of the adulteration of the ultramarine. This is easily, however, detected by the method above given of putting some of it into a small quantity of spirit of nitre, which, if there be any copper in it will
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be tinged green. But there is another means of sophistication, that will not render the colour liable to fly : and indeed it is well it is so, because the difficulty of distinguishing it, when not in a high degree, is much greater. This is, the commixing, with the ultramarine ashes, smalt ground and washed over : which, when good, and thus treated, has so much the appearance of the other, that it is scarcely possible to perceive any difference by inspection. The smalt nevertheless, however well ground, will never mix kindly with oil ; but fall from it if much moistned, or with less oil forms a patty matter : nor will it spread when mixed with white and oil, in any proportion like the ultramarine ashes. By these properties, therefore, suspected quantities may be best judged of : as the adulteration becomes apparent ; if the quantity of the smalt commixed with the true ashes render them predominant.

The method of preparing the ultramarine ashes is as follows.

“ Take the cement of the ultramarine, which
 “ remains after the colour is extracted ; and mix
 “ it with four times its weight of linseed oil. Let
 “ the mixture be set in a glazed pipkin over the
 “ fire ; and, when it is thus boiled a short time,
 “ put it into a glass vessel, sufficiently large to
 “ contain it, of a cylindrical figure : of which
 “ vessel the diameter must be small in propor-
 “ tion to the length. But care must be taken,
 “ that the matter when put into this glass be
 “ cool enough not to endanger the breaking
 “ it.

“ it. This glass must then be put into a bal-
“ neum mariæ ; which must be made as hot
“ as possible without boiling ; and kept there
“ till the colour appear to be all subsided to the
“ bottom. The oil must then be poured off
“ till the colour appear to rise with it ; and
“ the remainder, with the colour in it, must
“ be put into another glass of the same kind
“ with as much fresh oil as will rise five or six
“ inches above the colour. This glass must
“ be treated in the same manner as the first :
“ and, when the colour has subsided, the oil
“ must be poured off, and a fresh quantity
“ put in its place. This having been likewise
“ poured off, the colour must then be well
“ washed, to free it from the remaining oil,
“ first in boiling water, and afterwards in some
“ of the lixivium abovementioned made boil-
“ ing hot also. As much of the lixivium be-
“ ing poured off, when the colour has sub-
“ sided, as can be separated from it that way,
“ the colour must be thoroughly freed from
“ the remainder by frequent ablutions with
“ clean water. After which the water must
“ be taken off by the means above directed
“ for the ultramarine, till the matter be of a
“ proper degree of moisture for grinding. It
“ must then be thoroughly well ground on a
“ porphyry ; and washed over ; that all the
“ harder and insufficiently calcined parts
“ may be reduced to an impalpable pow-
“ der : in order to which, the remaining
“ grosser parts, after the finer have been sepa-
“ rated

“ rated by the washing over, must be again
“ ground till the whole be perfectly fine.
“ The same means must be afterwards used
“ to bring the ashes to a dry powder that were
“ before directed for the ultramarine.”

Of Prussian blue.

Prussian blue is the fixt sulphur of animal or vegetable coal, combined with the earth of alum; and may be made from almost any animal, and many kinds of vegetable substances; though, from reasons of expedience, it is generally made of the coal of blood only. It is used in all kinds of painting except enamel; and is prepared of many different degrees of brightness, and strength; as well as of different tints: some parcels being, though rarely, of a true unmixed blue, but the far greatest part of a purple hue; though the proportion of the tinge of red is frequently various, according to the different manner of, or accidents attendant on, the management of it. With respect to standing, Prussian blue can neither be esteemed the most perfect, nor the most faulty, colour. When it is very dark, that is, when the tinging particles bear a large proportion to the earth, it will sometimes stand extremely well; but it is apt then to want brightness, and be very purple: on the other hand, when it is light, or with a small proportion of the tinging part, it is more frequently bright, and cool, as it is called, (that
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is, clear of any mixture of red) ; but extremely subject to fly, or to turn to a greyish green. This is not, however, universal, for I have seen some very dark, which has been pretty bright and cool ; as likewise some that has been light, which would stand perfectly well. The common Prussian blue, however, found in the shops, which is prepared almost wholly, at present, by ignorant and fordid people, and sold at very low prices, can be very little depended upon in paintings of consequence ; but whoever would have this pigment perfect, should either prepare it, or procure it to be prepared, in the proper and true manner ; and then considering the high price of ultramarine, and the foulness of indico, it may be deemed an acquisition to the art of painting.

The Prussian blue may be prepared in perfection by the following process.

“ Take of blood any quantity ; and evaporate it to perfect dryness. Of this dry blood, powdered, take six pounds, and of the best pearl-ashes two pounds : mix them well together in a glass or stone mortar ; and then put the mixt matter into large crucibles or earthen-pots ; and calcine it in the furnace described, p. 22 ; the top of the crucible or pot being covered with a tile, or other such convenient thing, but not luted. The calcination should be continued, so long as any flame appears to issue from the matter ; or rather till it become very slender and blue ; for if the fire be very strong, a small

" flame would arise for a very long time,
 " When the matter has been sufficiently cal-
 " cined, take the vessels which contain it out
 " of the fire; and, as quickly as possible,
 " throw it into two or three gallons of water;
 " and, as it soaks there, break it with a wooden
 " spatula, that no lumps may remain. Put
 " it then in a proper tin-vessel, and boil it for
 " the space of three quarters of an hour or
 " more; and filter it while hot through paper
 " in the tin cuilenders described, p. 27; and
 " pass some water through the filter when it
 " is run dry, to wash out the remainder of the
 " lixivium of the blood and pearl-ashes; the
 " earth remaining in the filter may be then
 " thrown away. In the mean time, dissolve
 " of clean alum four pounds, and of green
 " vitriol or copperas two pounds, in three
 " gallons of water. Add this solution gra-
 " dually to the filtered lixivium, so long as any
 " effervescence appear to arise on the mix-
 " ture; but, when no ebullition or ferment
 " follows the admixture, cease to put in more.
 " Let the mixture then stand at rest, and a
 " green powder will be precipitated: from
 " which, when it has thoroughly subsided,
 " the clear part of the fluid must be poured
 " off, and fresh water put in its place, and
 " stirred well about with the green pow-
 " der; and, after a proper time of settling,
 " poured off like the first. Take then of
 " spirit of salt double the weight of the green
 " vitriol which was contained in the quantity
 " of

“ of solution of vitriol and alum added to
“ the lixivium, which will soon turn the green
“ matter to a blue colour; and, after some
“ time, add a proper quantity of water, and
“ wash the colour in the same manner, as
“ has been directed for lake, &c. ; and when
“ properly washed, proceed in the same man-
“ ner to dry it in lumps of convenient size.”

By the proportions as given in this process, if it be rightly conducted, the Prussian blue produced will be both deep and bright: but where it is desired to be of lighter colour, the quantity of dried blood must be lessened: for if it be even reduced to one half, a beautiful light blue may be made. The proportion of vitriol may, if only half the proportion of blood be used, be also reduced to half; and likewise the spirit of salt in proportion to that: the only use of the spirit being to redissolve the oker or iron precipitated from the vitriol. But if any abatement be made in the quantity of vitriol, an equivalent weight of the alum must be substituted in its place; that there may be a sufficient proportion of one or other of these salts, to precipitate the sulphur of the blood from the lixivium.

If the quantity of spirit of salt prescribed fail, however, to convert the precipitated matter from green to perfect blue, a greater proportion must be used. For though the quantity directed be fully sufficient, when the spirit is of due strength; yet, as it is frequently found weak when purchased of the chemists,
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or those who sell it, there can be no certain dependance laid on any rule without observing that the effect be correspondent.

Prussian blue, when made in great quantities, may, for expedition, be dried by heat: and this may be performed by means of a small furnace constructed in the following manner. Let a horizontal funnel of brick-work be built, with a vent at one end, opening into a chimney. This funnel must be of such breadth, as will admit its being covered by plates of tin: and its length must be regulated by the quantity of matter there may be occasion to dry. The plates of tin should be well varnished over, as well on the under as upper side, by drying oil boiled to a thick consistence and black colour; and then rendered again fluid by means of oil of turpentine. They should be cemented to each other, where they join, by putty mixed with the above varnish: but they may be fixed to the brick-work, which they rest upon, by fire-lute, and Dutch, or other tiles, laid over the edges. In the front of this funnel, must be made a small fire-place for burning charcoal, which must vent itself into it instead of a chimney. The Prussian blue to be dried must be laid in the form of a cake upon these tin-plates; and then scored cross with a piece of horn both ways; by which means, as the moisture exhales, and the mass shrinks, each square, formed by the scoring, will be a separate lump. Okers, and all other earths, as also vermilion, may be dried

dried in the same way on these plates: but, as those substances have nothing gummy or adhesive in their texture, they may be laid on paper upon the plates; which will prevent their contracting any foulness from them.

The goodness of Prussian blue must be distinguished by its brightness, deepness, and coolness: and where these qualities are found together in any parcel, it may be depended upon that it will stand well; for whatever is added to it to sophisticate it, or whatever is done amiss in the process, will always render it more foul and purple. The most certain way to judge of it is, therefore, to try it with white lead, or flake white, and oil; where the above qualities will display themselves, or appear wanting, in a much more distinguishable manner than in the lumps of unmixed colour. In the preparation of the coarser kind of common Prussian blue, a great part of the oker or iron precipitated from the vitriol is left in the pigment: but in good Prussian blue there ought to be no iron. For in time it overpowers the blue of the sulphur of the coal, and shews its own proper tinge of yellow in the paint: as may be seen in all blue wainscots, or other work done by house-painters; which in a short space of time turn to an olive or greenish-gray colour. The presence of iron in Prussian blue may be discovered by boiling a small quantity of what is suspected in a lixivium of pearl-ashes, to make a separation of the colour from the remaining earth; which, if it
partake

partake of the other, will appear yellow when washed and dried; but if free from it, white or gray.

Of verditer.

Verditer is the mixture of chalk and precipitated copper, which is formed by adding the due proportion of chalk to the solution of copper made by the refiners in precipitating the silver from the aquafortis, in the operation called parting; in which they have occasion to dissolve it in order to its purification. Verditer is, when good, a cool full blue, but without the least transparency either in oil or water. It is of a moderate degree of brightness; and would have consequently a considerable value in the nicer paintings, where it would supply the place of ultramarine, or at least of the ultramarine ashes, if it could be depended upon: but in oil it is very subject to turn greenish, and sometimes black; and in water, where it is safer, it is yet not always found to hold: for which reasons it is rejected, except in paper hangings and other coarse work, or in varnish, where this objection to it ceases.

Verditer is only to be had at a cheap rate from the refiners, who are at no expence in the making it, but that of the chalk and labour, as they could find no other use for the solution of copper made by precipitating the silver from the aquafortis, in one of their most common operations, were they not to apply it to this.

The manner in which it may be best done by them is as follows.

“ Take any quantity of chalk, and having rendered it properly fine by washing over carefully, add it gradually to the solution of copper, so long as any change appears to be produced by it from the ebullition excited : or the due proportion may be perceived by the fluid’s losing its green tinge and becoming colourless. Let it then stand at rest till the sediment be subsided ; and pour off the clear part of the fluid from the powder ; adding in its place clean water, which must be several times renewed till the salts be entirely washed out ; when the sediment, which is the verditer, must be freed from the fluid by filtering through paper covered with a cloth, and laid out in lumps of a middling size to dry.”

The verditer as commonly found requires no subsequent preparation for its being used : only where, as is frequently the case, from using chalk in the making of it that is not purified, it is found gritty and not sufficiently fine, and should then be washed over.

Those who desire to make verditer themselves, may prepare the solution of copper, by adding copper filings gradually to aquafortis of any kind, or putting plates of copper into it ; and then proceeding as is above directed for the refiners solution. It is not so expensive when prepared in this manner, but that it will well
answer

answer to those who cannot conveniently procure that prepared by the refiners.

Verditer is not subject to be adulterated, as nothing cheaper of the same appearance can be mixed with it. Its goodness must be distinguished by the darkness and brightness of the colour; and that is likewise to be preferred which is of the fullest blue teint, and not inclining to green: As it may be inferred from thence that the colour will stand the better. A much deeper and brighter kind of verditer may be made by using a filtered solution of pearl-ashes, in the place of the chalk, and proceeding, as to all other particulars, according to the above directions.

Bleu de Cendres, or Sanders blue.

This colour, or rather name, is of late introduction, and has taken its rise, in all probability, from some French painters having taught the use of verditer in water colours under the name *Cendre bleu*; which the French in common style give to it. This has been corrupted into *Sanders blue*; and the late writers, who have pretended to teach the art of painting in water-colours, &c. have amongst other blunders and absurdities, spoken of this as a distinct colour from verditer, known and in common use. There is nothing, however, to be found, on the most diligent inquiry, in the colour-shops, under this name, but common verditer; or a species of it where the

precipitation of the copper appears to be made in part upon starch, as well as chalk. But this by no means answers the description of the author of a pamphlet published by Mr. Peel in the year 1731, who says, "Sanders blue is of very good use, and may serve as a shade for ultramarine or the blue bice, where the shades are not required to be extremely deep, and is of itself a pleasant blue to be laid between the lights and shades of such a flower as is of a Mazarine blue." By which it is plain the Sanders blue meant here cannot be any kind of verditer; as that is always lighter than the ultramarine itself; and can therefore never be a shade to it. Unless the species of verditer mentioned above has been prepared darker than at present, as is practicable, and sold under such a name, this author must have made some mistake; or imposed upon the public, by writing what occurred to his imagination without regard to fact.

If any, however, may desire to prepare a dark verditer of the kind here spoken of, they may do it in the following manner.

"Take of the refiners solution of copper
 "made in the precipitation of silver from the
 "spirit of nitre; or dissolve copper in spirit of
 "nitre or aquafortis, by throwing in filings
 "or putting in slips of copper gradually, till
 "all effervescence cease. Add to it of starch
 "finely powdered, the proportion of one fifth
 "or sixth of the weight of the copper dissol-
 "ved.

“ ved. Make then a solution of pearl-ashes,
 “ and filter it; and put gradually, to the so-
 “ lution of copper, as much as will precipi-
 “ tate the whole of the copper; which may
 “ be known by the fluid’s becoming clear and
 “ colourless, though before highly tinged with
 “ green. Wash the powder, which will be
 “ precipitated, in the manner directed for
 “ lake, &c.; and, when it is so well drained
 “ of water by means of a filter, as to be of a
 “ proper consistence, grind the whole well
 “ together, and lay it out to dry.”

Of indico.

Indico is a tinging matter extracted from certain plants by means of putrefaction, and a coagulation by the air. It is brought from the East and West Indies, and cannot, as far as is hitherto known, be prepared in these colder climates, on account of the tender nature of the plants which produce it. It was formerly almost the only blue colour used in painting, either with oil or water, except ultramarine; which, from its great price, could only be applied to very nice purposes: but, at present, the invention of Prussian blue, and the foulness of the indico brought from the French or our own plantations, which is greatly inferior in brightness to that made in the Spanish West Indies, which was formerly imported here, have almost banished the use of it as a paint, except for paper-hangings, or such gross uses.

uses. Where the best Spanish indico, nevertheless, can be procured, it is preferable for many purposes to Prussian blue, of the same degree of brightness, from its certainty of standing: but it is never found either of the first degree of brightness, nor so cool as to be fit for all the uses to which Prussian blue can be applied.

There is no other preparation necessary to the using indico in painting, except a perfect levigation; to which, for nicer purposes, washing over may be added.

The goodness of indico may be discerned by its darkness and brightness: and, as it is always apt to be purple, coolness gives a great additional merit to the best for the uses of painting.

Of smalt.

Smalt is glass coloured with zaffer, and ground only to a very gross powder. Its texture does not permit it to be worked with either brush or pencil; but it is used for some purposes, by strewing it on any ground of oil-paint while wet; where it makes a bright warm blue shining surface, proper for large sun-dials, and other such applications.

It is prepared from fluxing zaffer with glass of salts: the proportion of which may be one seventh part, or more or less according to the degree of deepness required in the smalt.

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The goodness of smalt consists in its being dark bright and cool, though it always verges on the purple.

Of bice.

Bice is smalt reduced to a fine powder by levigation. It is a light warm blue colour, and was formerly used in oil, more frequently in water colours; but from its unsuitable texture it is now greatly disused.

Its goodness lies in the brightness and coolness. This holds good only of the original and true bice; for at present several compositions of indico and verditer, with chalk or other cheap substances, are sold in the name of bice.

Of litmus, or lacmus.

Litmus is a blue pigment brought hither from abroad, and formed from blue flowers. It is only used in miniature paintings, and cannot be there well depended upon, as the least approach of acid changes it instantly from blue to red; though it will stand if no such accident intervene. The original preparation of litmus is by bruising or pounding the leaves of the flowers, picked off from the other parts, till they become a pulp; from whence the juice must be carefully kept from running off; which juice must be afterwards reduced to a dry mass by evaporation in balneo mariæ. But
as

90 OF THE SUBSTANCES

as there are no flowers in this country, except the cyanus or corn-bottle, which afford a blue colour, and can be procured in a sufficient quantity, the preparation of this colour is not profitably practicable here, as it can be had from abroad at a very moderate price. The preparation of this colour, previous to its use in miniature painting, I shall give in its proper place, when I speak of the commixture of water-colours, with their proper vehicles.

CLASS III. Of yellow colours.

Of King's yellow.

KING's yellow is a pure orpiment, or arsenic coloured with sulphur. It is used for painting in oil and varnish: and is of an extreme bright colour, and when good a true yellow; it will likewise stand well being used alone: but when mixed with white lead, and several other pigments, its colour flies or changes. On this account, and for the additional reasons of its being esteemed a poison, and having a most nauseous smell, it is rejected by many; but others find too much advantage in its great brightness, as well in the use of it as a yellow, as when mixed with blue pigments to form a green, not to have recourse to it on some occasions.

This pigment must be prepared by mixing sulphur and arsenic by sublimation, which may be done in the following manner.

“ Take of arsenic powdered and flowers of
“ sulphur in the proportion of twenty of the
“ first to one of the second : and having put
“ them into a sublimer, sublime them in a
“ sand-heat, with such a furnace as is de-
“ scribed p. 20, according to the general di-
“ rections given p. 30. The operation be-
“ ing over, the king's yellow will be found in
“ the upper part of the glass ; which must be
“ carefully separated from any caput mortuum
“ or foul parts that may be found in the glass
“ with it. It must be afterwards reduced to
“ an equal powder by levigation.”

It may likewise be obtained from common
orpiment, by subliming it, instead of the ar-
senic and sulphur, in the same manner.

The king's yellow may be rendered warmer,
that is more inclined to orange, by increasing
the proportion of the arsenic ; or the contrary
effect may be produced by diminishing it.

King's yellow cannot be adulterated with-
out diminishing its brightness : and therefore
that which is best in this respect may be
esteemed good in others. Coolness, or the
being free from red, is likewise a merit.

Of Naples yellow.

Naples yellow is a warm yellow pigment
rather inclining to orange, but in a very mi-
nute degree. It is seldom used but in paint-
ing with oil : where it is generally found to
stand well ; but, if it touch iron along with
the

the least watery moisture, it will be changed by it. As it is brighter than most yellows used in oil, and indeed than all at present in use, except the king's yellow, it is much received into practice. It has been supposed to be a native earth, and is said to be found in the neighbourhood of Naples; but this is dubious, as the different parcels of it vary too much from each in specific qualities to allow the supposition of their being native earths of the same kind, at least with respect to such as are to be obtained from our shops; for I have met with some that was of a very different composition from the common. The uncertainty with regard to the genuineness renders this pigment less valuable, as it is less to be depended upon with respect to its holding its colour. Whether, however, it is an earth that is at present generally sophisticated, or what the preparation of it is, we are at present ignorant of, as it is brought from abroad; and this makes it more difficult to give marks of its genuineness; which may therefore be best gathered from its appearance and manner of mixing with the oil, in which the more adulterate kinds differ from the common.

Though Naples yellow is of a gritty texture, yet it is best to use it as it is obtained, and only grind it with the oil; for it does not well bear levigation with water. But if such levigation be nevertheless practised on it, the greatest care must be taken to employ an ivory spatula in the place of a pallet knife; which
would

would certainly injure the colour, if it were touched with it while wet ; and even when moistened with oil, the iron is in some degree injurious to it.

Of yellow oker.

Yellow oker is a mineral earth, which is found in many places, but of different degrees of purity. When free from other earths and heterogeneous matter, it is a true yellow of moderate brightness : and, as its texture suits it for all kinds of painting, and that it will never fly in the least, it is a very valuable colour with respect to its utility, though of low price.

There is no other preparation of yellow oker necessary than levigation : and for nicer purposes washing over ; to undergo which its texture is extremely suitable.

The goodness of yellow oker may be distinguished by the brightness and fulness of its yellow colour ; and if it be bright, it cannot be too cool. But as it is not unusual to mix it with Dutch pink, and set an extraordinary price upon it as being extremely good, that imposition must be guarded against ; which may be done by heating it to the degree that will turn paper brown ; which if it be genuine will make little or no alteration in it ; but if it be adulterated in this manner will give an apparent foulness to it.

Of

Of Dutch pink.

Dutch pink is a pigment formed of chalk, coloured with the tinging particles of French berries or other vegetables. It is principally used for coarser purposes in water ; not bearing well to be worked in oil : nor can it be depended upon with regard to its standing so as to be fit for paintings of any consequence.

There are a variety of methods of preparing Dutch pink : but the following is very cheap and easy ; and makes a most beautiful pigment.

“ Take of French berries one pound, and
“ of turmeric root powdered four ounces ; boil
“ them in a gallon of water two hours ; and
“ then strain off the tincture through flannel,
“ and boil it again with an ounce of alum till
“ it be evaporated to one quart. Prepare in
“ the mean time four pounds of chalk, by
“ washing it over, and afterwards drying it :
“ and mix the chalk with the tincture, by
“ grinding them together : and then lay out the
“ Dutch pink thus made to dry on boards.”

Dutch pink is sometimes prepared in the same manner with starch and white lead.

The goodness of Dutch pink consists in its being of a full gold coloured yellow, and very bright.

Of

Of English pink.

English pink is only a lighter and coarser kind of Dutch pink.

Of light pink.

Light pink is of two kinds, the one the same with the Dutch pink, only with greatly less colour: the other the same with the brown pink; that is, transparent in oil, but with less colour.

The first kind like the Dutch pink is only fit for using in water; and there, likewise, only in paintings where the holding of the colour is not of great consequence.

The other is by some used in oil paintings, in the same manner as brown pink: its transparency making it have a good effect in shades for some purposes; but it is not a judicious practice: for all these colours formed of vegetables are very uncertain with respect to their standing; and the native earths or prepared okers properly managed will answer equally the same ends.

The preparation of the first kind of light pink may be in the same manner as that of the Dutch pink; only diminishing the proportion of the French hernes and turmeric to one half.

The light pink may be prepared in the following manner.

The

“ Take of French berries one pound. Boil
 “ them with a gallon of water for an hour: and
 “ then strain them off; and add two pounds of
 “ pearl-ashes, dissolved and purified by filter-
 “ ing through paper. Precipitate with alum
 “ dissolved in water, by adding the solution
 “ gradually, so long as any ebullition shall
 “ appear to be raised in the mixture. When
 “ the sediment has thoroughly subsided, pour
 “ off the water from it; and wash it with
 “ several renewed quantities of water, pro-
 “ ceeding as has been before directed in the
 “ case of lake, &c.; and then drain off the
 “ remaining fluid in a filter with a paper
 “ covered with a linnen cloth; and lastly dry
 “ it on boards in small square pieces.”

It may be likewise prepared from fustic
 wood, yellow sanders, and several other vege-
 table substances, which afford copiously a yel-
 low tinge.

The goodness of light pink lies principally
 in its brightness and transparency: and, when
 designed for the shops, care should be taken
 that it do not fatten in the oil; which will
 happen, if the salts be not thoroughly washed
 out of it.

Gumboge.

Gumboge is a gum brought from the East
 Indies. It dissolves in yellow to a milky con-
 sistence, and is then a bright light yellow. It
 is used only in water: but there is of great
 service;

service, being the principal ; or, indeed, almost the only yellow commonly employed.

Gamboge requires no preparation, but dissolves immediately on rubbing it, with the addition of water.

The goodness of gamboge may be distinguished by its appearance while in the state of a gum of a deep warm bright colour : and the more it approaches to transparency the better.

Of masticot.

Masticot is flake white, or white lead, gently calcined ; by which it is changed to a yellow of lighter or deeper tint, according to the degree of calcination. It is not greatly used at present ; the colour not being very bright : but as it will stand perfectly in oil ; and in water, as well as flake white, or white lead, it certainly might be used for many purposes ; as it works with the pencil better than most other pigments.

It may be prepared by putting the flake white, or white lead, on an earthen or stone dish before a strong fire ; and continuing it there till the colour be sufficiently yellow ; each side of the plate being put next to the fire in its turn, that the whole of the masticot may be equally calcined : or the matter to be calcined may be put into a crucible ; and the crucible placed in a moderate heat in a common fire ; care being taken to remove it as soon as the masticot appears of a proper colour ; which

H

must

must be distinguished by taking a part of it out, for the colour does not shew itself properly while the matter is hot. The calcination being finished, the parts which are of the tint wanted must be picked out from the rest, and put together : for, with the greatest care, it is difficult to calcine the whole equally ; and consequently to avoid rendering some parts of a deep yellow or orange.

There is no further preparation necessary for the using masticot either in oil, or water painting, except the grinding it with the vehicle.

Common orpiment.

Common orpiment is a fossile body composed of arsenic and sulphur, with a mixture frequently of lead, and sometimes other metals. It was formerly used as a yellow in painting ; but at present is very seldom employed in its unrefined state, unless to colour the matted bottoms of chairs or other such coarse work. When purified by subliming, it becomes the king's yellow, of which we have before spoken. It is of a pale yellow colour, and might be useful for several purposes, if its nauseous smell, and supposedly poisonous quality, did not make the meddling with it disagreeable, particularly in oil, where its bad scent is greatly increased. The goodness of orpiment consists in the brightness and strength of its colour ; and the warmer, or
rather

rather the less inclining to green, the better it is for the purposes of painting.

Of gall stones.

Gall stones are concretions of earthy matter and bile formed in the gall bladder, or bile ducts of beasts. It is used by those, who know the secret of its excellence, in water : with which being rubbed, and treated as gamboge, it becomes a deep warm yellow, that for its brightness and dark shade, when not too thin spread, as well as holding its colour, is very valuable.

As the gall stones are not always to be procured, a fictitious kind may be prepared ; which will greatly answer the same purpose. They may be made in this manner.

“ Take a quart of the bile of oxen, as fresh as possible. Put it into a proper pewter vessel ; and set it to boil in balneo mariæ ; having added to it a quarter of an ounce of clear gum Arabic. Evaporate the whole to about an eighth ; and then remove it into a China cup or basin of proper size ; and evaporate it to dryness ; collecting it into a mass as it becomes of a stiff consistence.”

This may be used as the gall stones : and, being more transparent, will be found of very great advantage in water painting.

Terra de Siena unburnt.

Terra de Siena, as we have said before, speaking of it as a red when calcined, is a native ochrous earth, brought from Italy. In its uncalcined state it is a deepish warm yellow, and but slightly transparent either in oil or water. It is much less used uncalcined than calcined : but, nevertheless, as it is a deeper yellow by many degrees than any of the other okers, and of a superior brightness, it might be used with advantage, as it will stand equally with the best.

When terra de Siena is used uncalcined, it ought to be extremely well levigated and washed over ; otherwise it is apt to lie heavy in the oil ; which is probably the chief reason why it is so seldom used in an uncalcined state ; though as much wanted for some purposes as the calcined for others.

Turpeth mineral.

Turpeth mineral is a preparation of mercury, by calcining it together with oil of vitriol. It is an excessive bright true yellow, of a great body like vermilion ; and will stand equally well with that : and it works likewise with oil or water much in the same manner. These qualities render it very valuable for many purposes ; as it is much brighter than any other yellow used in oil, except king's yellow ;

low; and is free from the nauseous smell of that pigment; as well as cooler. This coolness, and its bearing to be mixed with Prussian blue, from whence a much finer green can be produced by it than from the king's yellow without ultramarine, give it, on the whole, greatly the preference. It has not, however, that I know of, been used in painting by any except those to whom I have recommended it: and who, on trial, have found it answer to what I have here said of it.

The turpeth mineral may be best prepared in the following manner.

“ Take of pure quicksilver, and oil of vitriol, each six pounds. Put them into a retort; to which, being placed in the sand-bath, fit on a receiver; and distill them with a strong fire, while any fumes appear to rise into the receiver; urging it at last with as great a heat as the furnace will bear. When the retort is again cold, remove it out of the sand bath: and, having broken it, take the white mass, which will be found at the bottom of it, and break it to a gross powder; and, having put it in a glass mortar, pour water on it; which will immediately convert it to a yellow colour. Let it then be thoroughly ground in this mortar, with water, and afterwards washed with several successive quantities. It must then be thoroughly well levigated on a stone, and dried.”

The turpeth mineral may be had from the shops of any chemists or dealers in medicines;

but is not at present in those of colourmen. As it is now to be procured, it requires a previous levigation in water before it be used; being for the most part, (though faultily,) levigated for the uses of the medicine only in a very slight manner. The marks of goodness in the turpeth mineral are the brightness of the colour; and its fulness or warmth: for as it never inclines more to the red than a true yellow, the less it verges on the green, the better it consequently is for the purposes of painting.

Of the yellow wash from the French berries.

This is a solution of the gum of the French berries in water. It is used as a washing colour in water painting: and as it may be made of almost any degree of deepness, and is pretty bright, it is applicable to many material purposes, since nothing can be made of the gamboge but light tints. This colour will stand also extremely well, and being more diluted or laid on thicker, will in consequence of its transparency, give a variety of shades.

The yellow-berry-wash may be thus prepared,

“ Take a pound of the French berries, and
 “ put to them a gallon of water, with half an
 “ ounce of alum, boil them an hour in the
 “ pewter vessel described p. 24, and then fil-
 “ ter off the fluid, (through paper if it be
 “ designed for nicer purposes, or flannel for
 “ more

“ more ordinary.) Put them again into the
 “ boiler and evaporate the fluid till the colour
 “ appear of the strength desired ; or part may
 “ be taken out while less strong, and the rest
 “ evaporated to a proper body.”

The goodness of the French berries may be distinguished by their appearing large, plump, and heavy ; and if they have these qualities, the darker they appear the better : but unless they are large and plump, the darkness may only arise from their being gathered before they are duly ripe.

Turmeric wash.

The turmeric wash is the gum of the turmeric root dissolved in water. The qualities and uses of it, are much the same as the yellow berry-wash ; only it is a brighter and cooler yellow ; but so strong a tincture cannot be made of it in water as of the French berries.

It may be also prepared in the same manner as the former.

Of tincture of saffron.

Tincture of saffron is used as a yellow wash with water colours. It is made by pouring hot water on the best English saffron in a proper phial or other vessel ; which should be placed for some time in a heat next to that which would make the water boil : and the tincture should

H 4 then

then be filtered from the dregs through a piece of linnen cloth. The proportion of the saffron to the water must be regulated by the intention of having the colour deeper or paler. This tincture is a fine warm yellow ; and when very strong makes a very proper shade for the gamboge or other light yellows that are bright : and it will stand equally well with any of the vegetable tinctures.

CLASS IV. Of green colours.

Of verdigrise.

VERDIGRISE is a rust or corrosion of copper formed by the action of some vegetable acid, commonly that of the skin and pulp of grapes remaining after they have undergone a pressure for wine. It is brought from Italy hither ; and used in most kinds of painting, where green is required. Verdigrise makes a blue green colour in paint : but is generally used with yellow, which by a proper mixture renders it a true green. It is bright when good ; but very soon flies when used in oil : but when used in water painting it is dissolved previously in vinegar ; which, indeed, changing it to another substance, renders it more durable.

It is needless to give any process for the making verdigrise ; because it may be purchased much cheaper than it can be here made : the pressings of the grapes in countries where
much

much wine is made saving the expence of the acid; which as it must be vinegar could not be procured here without cost: these pressings are rubbed on plates of copper, which are then put in moist places, till a strong corrosion or rust is formed, which beaten or scraped off is the verdigrise.

There is no other preparation of it necessary to the using verdigrise in oil or varnish, except a sufficient levigation; but in water painting, as is said before, it must be dissolved in vinegar; when in fact it ceases to become verdigrise, and is a salt of copper; the same with the chrystals of verdigrise we shall next treat of.

Solution in vinegar is not, however, the only method by which verdigrise may be used in water painting: for it will dissolve in the juice of rue; and produces a fine full green colour equally fit for washing with that dissolved in vinegar.

The goodness of verdigrise may be distinguished by the fulness of its blue green colour, and inclining rather towards a chrystalline texture than the form of a powder; to which must be added its being free from feculencies,

Chrystals of verdigrise, called distilled verdigrise,

Distilled verdigrise is the salt produced by the solution of copper, or common verdigrise, in vinegar. The chrystals thus formed are of an extreme bright green colour; and in varnish, where they stand perfectly well, they have a
very

very fine effect. In oil they hold their colour well enough to answer many purposes, where colours are not required to be greatly durable ; but in paintings of consequence they cannot be depended upon, being apt to turn black with time.

The chrystals of verdigrise may be prepared in the following manner.

“ Take of the best verdigrise four ounces,
 “ and of distilled vinegar two quarts. The
 “ verdigrise being well pounded, let them be
 “ put into a circulating vessel, which may be
 “ formed of a mattrafs, (which is a round
 “ bodied glass with a long strait neck) and a
 “ Florence flask, which must have its neck
 “ inverted into the mattrafs, the thick end be-
 “ ing broken off. This circulating vessel must
 “ be placed in a gentle sand-heat, or other
 “ warm situation, where it must continue,
 “ being frequently shaken, till the vinegar has
 “ dissolved as much as it can of the verdi-
 “ grise. Remove the verdigrise and vinegar
 “ then into a proper glass for decanting the
 “ fluid, when it shall become clear, from
 “ the sediment : and when it has stood a due
 “ time to settle, let it be carefully poured off
 “ and evaporated to about half a pint ; which
 “ may be best done with a sand-heat, in a
 “ glass body or cucurbit, having its neck cut
 “ off to form a wide mouth. It may be set
 “ to shoot in the same vessel or in a glass
 “ receiver with a wide neck : and, when
 “ the chrystals are formed, they must be
 “ taken

“ taken out, and carefully dried in the
“ shade.

“ A fresh proportion of vinegar may be
“ added to the remains of the verdigrise,
“ which the first quantity left undissolved ;
“ and the mothers or fluid remaining after
“ the chrystals were formed may be put into
“ it : when, the other parts of the process be-
“ ing repeated, a second quantity of the chry-
“ stals will be obtained.”

The distilled vinegar produces the most beautiful chrystals of verdigrise ; but common vinegar is more frequently used by those who prepare them : as it is much cheaper, and will afford very good coloured chrystals, if care be taken in the evaporation not to suffer any part of it to burn to the glass ; to avoid which accident, it is proper, that the vessel, in which the evaporation is made, should not be sunk deep in the sand ; but only set upon it, or surrounded a little above the bottom.

The goodness of the distilled verdigrise may be perceived by the clearness of the chrystals ; and the bright green colour of them when powdered.

Of sap green.

Sap green is the concreted juice of the buck-thorn berries expressed from them.

It is a yellow green ; and only used in water painting ; where it is very useful for some purposes as a washing colour ; making a strong stain,

stain and pretty bright. It may be prepared in the following manner.

“ Take any quantity of buckthorn berries
 “ before they be ripe ; and press out the juice
 “ in such a press as is used for making cyder
 “ or verjuice ; or by any other method.
 “ Strain this juice through flannel, and then
 “ let it stand to settle ; and, when it has
 “ stood a proper time, decant off the clearer
 “ part of the fluid from the sediment. Put
 “ this juice into a stone or earthen vessel ; and
 “ evaporate it till it begins to grow of a thick
 “ consistence ; then put it into the pewter
 “ vessel described p. 24 ; and finish the eva-
 “ poration in balneo mariæ ; collecting the
 “ matter into one mass as it acquires a pro-
 “ per consistence.”

The marks of goodness in sap green are the transparency, brightness, and strength of colour, it appears to have when rubbed on paper.

Prussian green.

Prussian green is the same with the Prussian blue ; except that in the preparation the precipitated oker of the vitriol is suffered to remain with the precipitated earth of alum and the sulphur of the coal ; the addition of the spirit of salt, by which in the regular process for the Prussian blue the oker is redissolved, being omitted : and this oker being yellow, a green is produced by it through the effect

of the blue of the sulphur. The qualities of the Prussian green are much the same with those of the blue, except the difference of colour, and that it is not so transparent; nor, with regard to any I have hitherto seen, so bright; neither can it be so well depended upon for standing as the Prussian blue when well prepared, though it is nearly equal in that point to the common. As the qualities are so much the same, the uses to which the Prussian green may be applied are much the same with those of the blue, excepting difference of hue; and at one time this colour was gaining ground among painters of some kinds: but it has since then been neglected; and at present seems almost wholly laid aside, tho' I am not sensible of the reason why this pigment might not be of advantage in many kinds of painting, as well as the common Prussian blue.

The manner of preparing this pigment may be as follows.

“ Proceed in all points, as in the process
 “ given for the Prussian blue, till the solution of alum and vitriol be mixed with
 “ that of the pearl-ashes and sulphur of the
 “ coal, and the green precipitation made:
 “ then, instead of adding the spirit of salt,
 “ omit any further mixture, and go on to
 “ wash the sediment, which is the Prussian
 “ green; and afterwards to dry it, in the
 “ same manner as is directed for the blue.”

The

The goodness of the Prussian green consists in the deepness and brightness of the colour; and the more it is of a true tint of green, the better it is.

Terra verte.

Terra verte is a native earth, which in all probability is coloured by copper. It is of a blue green colour, much of that tint which is called sea-green. What we have in common here, is not very bright, but being semi-transparent in oil, and of a strong body in water, and standing equally well with the best pigments, it is very much adapted to answer some purposes in both kinds of painting; though it is not so generally used by those to whom it would be serviceable as it merits. Mr. D'Acosta says, in his book of Fossils, that there is a kind which is very bright, and is found in Hungary: if it could be procured here, it would certainly be a very valuable acquisition to oil painting; as the greens we are forced at present to compound from blue and yellow, are seldom secure from flying or changing.

Terra verte, as brought from abroad, is of a very coarse texture; and requires to be well levigated, and washed over: but no other preparation is necessary previously to its use. The only method of distinguishing its goodness is by the brightness and strength of its colour.

C L A S S

CLASS V. Of orange colours.

There is not any simple pigment, prepared commonly, which can properly come into this class: the effect of orange being produced in practice by the mixture of red and yellow: but the following preparation being of my own invention, and serviceable to some who have already made considerable use of it, I thought it proper to insert it for the benefit of others who may want such a pigment.

Of orange lake.

This orange lake is the tinging part of annatto precipitated together with earth of alum. It is of a very bright orange colour, and would work well with either oil or water; but cannot be depended upon, when used either of those ways, for standing long. It is, however, a very fine colour for varnish painting, where the fear of flying is out of question; and is also of an admirable good effect for putting under chrystal for the imitation of the vinegar garnet; for which purpose it has been used with great success.

The manner of the preparation of the orange lake may be as follows.

“ Take of the best annatto four ounces,
“ and of pearl-ashes one pound. Put them
“ together into a gallon of water, and boil
“ them half an hour; and then strain the so-
“ lution

" lution through paper. Make, in the mean
 " time, a solution of a pound and a half of
 " alum, in another gallon of water: and mix
 " it gradually with the solution of the pearl-
 " ashes and annatto; observing to cease any
 " further addition when the fluid becomes
 " colourless, and no further ebullition ensues
 " on the commixture. Treat the sediment
 " or precipitated matter, then, in the same
 " manner as has been before directed for o-
 " ther kinds of lake; only this need not be
 " formed into drops; but may be dried in
 " square bits or round lozenges."

CLASS VI. Of purple colours.

Of the true Indian red.

The true Indian red is a native ochrous
 earth, of a purple colour; and, before the
 cheapness of the fictitious kind, occasioned it
 to be rejected by the colourmen, and conse-
 quently disused by painters; was constantly
 brought from the East Indies, and sold in the
 shops. At present it is very rarely to be
 found; but when it can be met with, it is
 certainly very valuable (there being no other
 uncompounded purple colour in use with oil)
 as well for the force of its effect, as for the
 certainty of its standing: but the common
 kind, now fallaciously called by its name, has
 been, by degrees, from accommodating it to
 the purposes of house painters, made to vary
 from

from it till it is become intirely a different colour, being a broken orange instead of a purple.

The true Indian red, when it can be procured, needs no other preparation than grinding or washing over: and it may be easily distinguished from any fictitious kind, by its being more bright than any other oker which can be made so purple; and if it be rendered artificially purple by any addition, the fire will soon betray it; into which the genuine may be put without any hazard of change.

Of archal or orchal.

Archal is a preparation of logwood by means of lime and shreds of leather. It is an extreme bright purple fluid; and would be a beautiful wash, if it could be depended upon; but it is apt to dry to a reddish brown colour; and therefore at present much disused in painting; though it had formerly a place in the common set of water colours. It is used in great quantities for some purposes of dying, by people who make it their business; and may be had cheap of them, or the dry salters; but is scarcely worth the trouble of procuring.

Of the logwood-wash.

Logwood is brought from America; and affords a strong purple tincture in water; which will stain, of a bluish purple colour, almost

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most any body whatever capable of receiving such tinge. It is used frequently in miniature painting to make a purple wash; which is varied to a more red or blue colour by the addition or omission of Brasil wood. This wash may be prepared in the following manner.

“ Take an ounce of ground logwood; and
 “ boil it in a pint of water till one half of the
 “ fluid be wasted. Strain it then through
 “ flannel while of a boiling heat; and add to
 “ it, when strained, about ten grains of pearl-
 “ ashes, or about the bulk of a small French
 “ bean. If it be desired to be a more red
 “ purple, about half an ounce of Brasil wood
 “ may be added to the logwood; or in pro-
 “ portion as the colour wanted may require;
 “ and in this case the pearl-ashes must be
 “ used very sparingly, or not added at all,
 “ unless the tincture appear too red.”

CLASS VII. Of brown colours.

Of brown pink.

Brown pink is the tinging part of some vegetable of a yellow or orange colour, precipitated upon the earth of alum, cuttle-fish bone, or some such like calcarious substance. It is, when good, a concentrate yellow, which, the pigment being transparent in oil, gives the effect of a dark colour, and serves for deep shades. It is sometimes prepared of a warmer, and
 sometimes

sometimes of a cooler teint; and as each sort suits the purposes of particular kinds of painters, each kind is preferred by some according to their wants. Brown pink would be of great value in painting, if it could be depended upon with regard to its standing: and it was formerly, when all the colours of this kind were more honestly and judiciously prepared, in almost general use in this part of the world: but at present it is difficult to find any that does not fly, or has not some other bad quality, particularly that of fattening to an excessive degree; and therefore it is much disused; and will probably in a short time be intirely exploded from practice.

There are many methods of preparing brown pink; as there are a great variety of vegetables which afford a yellow tinge very copiously; and which, treated in the same manner as is practised for making lakes, will afford such a pigment. But the most common, and one of the best methods, is as follows.

“ Take of the French berries one pound,
 “ of fustic wood in chips half a pound, and
 “ of pearl-ashes one pound. Boil them in
 “ the tin boiler, with a gallon and a half of
 “ water, for an hour: and then strain off the
 “ tincture through flannel while the fluid is
 “ boiling hot. Having prepared in the mean
 “ time a solution of a pound and a half of
 “ alum, put it gradually to the tincture, so
 “ long as an ebullition shall appear. Proceed
 “ then

“ then to wash the sediment as in the manner directed for the lakes; and, being brought by filtering through paper with a linnen-cloth to a proper consistence, dry it on boards in square pieces.”

Brown pink may be made of the cuttle-fish bone dissolved in aqua fortis, in the manner described p. 58 for lake: and, in that case, the precipitation may be made with this solution instead of the solution of alum, by adding it to the tincture so long as it appears to make any ebullition on the mixture. The solutions of the alum and cuttle-fish bones may be otherwise mixt together, and used for the same end; which will be found much better than that of the cuttle-fish bone alone: for though the common opinion is, that lake or brown pink will stand better, when the basis is cuttle-fish bone, than when it is earth of alum, yet the earth of alum is necessary for attracting and bearing down with it the tinging matter: which, especially that of the French berries, is apt to remain dissolved in the fluid, and to be carried off with it in washing the brown pink.

Brown pink is also made without the means of salts in the following manner.

“ Take two pounds of the berries; and
 “ boil them in a gallon of water for two
 “ hours; and then strain off the tincture
 “ carefully through flannel. Prepare in the
 “ mean time a pound and a half of cuttle-fish
 “ bone, by separating the soft inner part,
 “ which

“ which is capable of being reduced to powder, from the hard exterior part, that must be thrown away, and levigating it well with water on a marble. Add then the cuttle-fish bone to the tincture, and evaporate them in balneo till the matter becomes of a stiff consistence; when the whole being well mixt by grinding, it may be laid on boards to dry.”

The goodness of brown pink must be judged of by its transparency, and force of colour, when mixed with oil: but its qualities of standing well, and not fattening in oil, which are both defects that frequently attend it, can only be ascertained by trial and experience.

Of bistre.

Bistre is the burnt oil extracted from the foot of wood. It is a brown transparent colour, having much the same effect in water painting; where alone it is used, as brown pink in oil. Though this colour is extremely serviceable in water colours, and much valued by those who know and can procure it, yet it is not in general use here, on account, I imagine, of its being not easily had of a perfect kind; for I have never heard of any that was good, except what has been brought from France. Perhaps the principal reason for this is, that dry beech-wood affords the best foot for making it; and it is not easy to procure such here without mixture of the foot of green

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wood, or other combustibles that deprave it for this purpose: or it is possible, that they, who have pretended to prepare it, have been ignorant of the proper means; there not being any recipe or directions in books, that treat of these matters, from whence they could learn them.

Bistre may, however, be prepared with great ease in the following manner.

“ Take any quantity of foot of dry wood,
 “ but let it be of beech where-ever that can
 “ be procured. Put it into water in the pro-
 “ portion of two pounds to a gallon; and
 “ boil them half an hour. Then, after the
 “ fluid has stood some little time to settle,
 “ but while yet hot, pour off the clearer part
 “ from the earthy sediment at the bottom;
 “ and if on standing longer it form another
 “ earthy sediment, repeat the same method:
 “ but this should be done only while the fluid
 “ remains hot. Evaporate then the fluid to
 “ dryness: and what remains will be good,
 “ bistre, if the foot was of a proper kind.”

The goodness of bistre may be perceived by its warm deep brown colour, and transparency: when moistened with water,

Of brown oker,

Brown oker is a fossile earth, the same with the other okers, except with regard to purity, and the teint of its colour, which depends on calcination, either in the earth or artificially.

It

USED IN PAINTING. 179

It is of a warm brown or fout orange colour; and, as it can be absolutely depended upon for standing, it is valued by some in nicer kinds of painting, but most used, being of very low price, for coarser purposes.

When brown oker is used for more delicate kinds of painting, it ought to be well levigated after it comes out of the hands of the colourmen; if had of them in the gross state in which it is commonly sold: but whoever would have it in the most perfect condition, must wash it over: which treatment should indeed be bestowed on all pigments of an earthy texture.

Of umbre.

Umbre is an ochrous earth of a brown colour. It was formerly used in most kinds of painting; but is at present neglected except by some in water colours. It is valuable on account of its property of standing well, which it has in common with most other native earths; and it is supposed to have a more drying quality than other okers, which has occasioned it to be much used in the making drying oils, the japanners gold-size, and the black oil lacquer.

The umbre is frequently burnt previous to its being used; which renders it more easy to be levigated; but it gives it at the same time a redder hue. Whether it be used in a burnt or unburnt state, it is necessary, however, to wash it over, when it is used in miniature painting,

painting, or for any nicer purposes; and that is all the preparation it requires.

Of asphaltum.

Asphaltum is a bituminous oil found in the earth in some parts of Asia, and probably elsewhere. It has a warm brown colour; and, retaining in some degree its transparency when dry, it answers the end of brown pink in oil painting, with the additional advantage of being secure from flying. It is not in general use, nor probably easily to be procured pure; but it is certainly useful, when to be obtained good. The only objection I have ever heard to it is, that it turns sometimes blackish; but I never saw an instance of that, though I have known it used by several: and believe that appearance is not owing to any change in its colour, but to that density of its substance which it contracts in drying; and which should be allowed for in the application of it.

There is no preparation necessary to asphaltum previous to its use; but it ought to be carefully preserved in a proper phial with a wide neck; otherwise it is subject to dry, and become too thick for the purposes of painting.

Asphaltum is very liable to be adulterated by the mixture of turpentine, and other cheap substances of a balsamic consistence, with it; and it is not easy to distinguish the fraud, but by the appearance: when the asphaltum is good,

good, it ought to be perfectly transparent, but of a warm deep brown colour.

Of the Spanish juice, or the extract of liquorice.

The Spanish juice is the succulent part of the liquorice root, extracted by decoction in water; and then strained off from the woody or undissolvable part of the root, and evaporated to dryness. It is sometimes prepared in this country, but mostly brought from abroad: and is now much used as a brown colour in miniature painting from its requiring no trouble to procure it, or render it fit for immediate use; and from the scarcity of good bistre: which nevertheless, when it is to be had, is greatly preferable to the Spanish juice; as well on account of the clearness of its colour, as from its being free from that viscid, or sticky quality, which attends the other on the least moisture.

CLASS VIII. Of white colours.

Of white flake.

WHITE flake is lead corroded by means of the pressings of the grape; and consequently in fact a ceruss prepared by the acid of grapes. It is brought here from Italy; and far surpasses, both with regard to the purity of its whiteness, and the certainty of its standing; all the ceruss, or white lead, made

made here in common. It is used in oil and varnish painting for all purposes, where a very clean white is required : but no kind of ceruſs ought to be used in water colours for paintings that are intended to endure time ; as it will generally turn black ; and appear, at length, as if the lead itself had been used instead of any preparation of it.

White flake is usually had of the colourmen in a prepared state, under the name of flake white : being levigated and mixed up with starch, and most frequently with white lead, or much worse sophistications. Whoever, therefore, would be certain of using this pigment pure, should procure the white flake in lump, as it is brought over ; and levigate it themselves : washing it over also ; and, if it be necessary, in order to the making it work more freely, they may grind it up afterwards with starch, in the proportion they shall find on trial most suitable to their purpose.

The test of goodness in white flake is the degree of whiteness ; which must be distinguished by comparing it with a specimen of any other parcel after it has been rendered of due fineness. But where it is suspected to be adulterated by any other mixture than that of white lead, the sophistication, and proportion of the spurious matter, may be ascertained by the same means as are below advised to be used for the examination of white lead.

White

White lead.

White lead or cerufs is the corrosion or rust of lead formed by means of vinegar.

It is made in our own country ; and is much cheaper than white flake ; but inferior in whiteness, and the other qualities which render this pigment advantageous in painting. It is, however, the white employed for all common purposes in oil painting ; and also the body or solid basis of the paint in many mixt colours, where the tint is of a lighter nature, or the coloured pigments will bear diluting with white.

It is made by dipping, or brushing, plates of lead in vinegar, or any other cheap acid : and putting them in a cellar or any cool damp place : but as this is carried on as a large manufacture, by those who are concerned in it, and who can consequently afford it at a much lower rate than any can prepare it for their own use, it is unnecessary to enter on a further detail with respect to the manner.

There is no previous preparation necessary, in the case of white lead, to its use ; except washing over where it is intended for more delicate purposes ; but then indeed it is always best to substitute the flake white.

Notwithstanding the low price of white lead, yet, being consumed in great quantities, it is for the most part adulterated by the manufacturers of, or wholesale dealers in it. The common

mon sophistication is with chalk or powdered talc ; as being the cheapest ingredients with which it can be mixt without changing too much its appearance. This in a lesser degree is of no great moment ; as they only diminish the quantity of body or covering matter in the paint ; but when in a greater proportion, they not only produce a great loss by rendering a larger quantity necessary to do the same work, but deprave the paint highly with respect to its other qualities.

The adulteration of lead white may be most easily examined, by comparing a piece of any that is suspected with another piece, known to be pure, of equal bulk ; and the difference of weight will shew the fraud where the heterogeneous matter is in great proportion : as it will necessarily be of a much lighter nature than lead : but, where the quantity of the adulterating matter is less, or the proportion of it would be more exactly known, the following method should be used.

“ Take an ounce of the white lead suspected ; and mix it well with about half an ounce of pearl-ashes, or of any fixt alkaline salt, and about a quarter of an ounce of charcoal dust : and, having put them into a crucible, give them a strong heat. The lead will by this means be reduced to its metallic state : and, being weighed, will shew, by what it may fall short of the weight of an ounce, the proportion of the adulteration ; about a tenth part being allowed

“lowed for the corroding acid which formed
“part of the white lead.”

Of calcined or burnt hartshorn.

Calcined hartshorn is the earth which makes the basis of horn, or indeed all other animal substances, rendered pure by the action of fire; which separate from it all saline and sulphureous substances. It is of the first degree of whiteness; and not subject to be changed by the air or time; and is, on account of these qualities, almost the only white now used in water painting for nicer purposes; white lead or flake, from the objection before mentioned with respect to their turning black, being greatly disused, by the more experienced painters.

It is not necessary, that this earth should be produced from the horn of stags: for any other horn, or indeed any other animal substance of the more solid kind, will equally well produce it. The common manner of preparation of this matter is to calcine, in an open furnace, the coal of the horn remaining after the distillation of the spirit of hartshorn: but what is sold for calcined hartshorn at present is more frequently the earth of bones: and if there be no further sophistication practised, this substitution is not in the least detrimental. It is, however, I am afraid, too usual to mix chalk or lime with the animal earth: which, by their alkaline power, change the
1 colour

colour of the vegetable pigments; and frustrate often the labour of the painter, without his being able to guess at the cause of his miscarriage. Whoever is desirous to prevent this inconvenience, and to have the burnt hartshorn perfectly pure, may prepare it easily themselves in the following manner.

“ Take horn, or bones, and burn them in
 “ any common fire till they become a coal,
 “ or are calcined to some degree of whiteness.
 “ Then, having freed them carefully from
 “ any other coal or filth, reduce them to a
 “ gross powder; and put them upon a vessel
 “ made, in form of a common earthen dish,
 “ of ground crucibles and Sturbridge clay, and
 “ well dried: and procure this to be placed
 “ in a tobacco-pipe maker’s or potter’s furnace,
 “ during the time they keep their pipes
 “ or pots in the fire. The earth of the horn
 “ or bones being thus thoroughly calcined, it
 “ must be very well levigated with water;
 “ and it will be yet further improved by being
 “ carefully washed over.

The perfection of calcined hartshorn lies in its whiteness and fineness; which may be distinguished by the sight and touch; and in purity also, which is not so easily discovered; but may be known nevertheless by the pouring oil of vitriol upon any suspected quantity; which will not produce any ebullition with pure calcined horn or bones; but will immediately excite an apparent fermentation with lime or chalk; the common matter with
 which

which they are adulterated, if any be mixt with them.

Of pearl white.

Pearl-white is the powder of pearls, or the finer parts of oyster-shells; but I suppose the former has rarely been used on account of the cleanness of the pearls; which are, moreover, not in the least better for this purpose than the oyster-shells properly managed.

This white is used in miniature paintings; and agrees much better with the vegetable colours than flake, white lead, or troy white.

The method of preparing the pearl white, is to take the oysters as they are found on the sea coast, calcined by the sun; or otherwise to dry fresh ones by the fire till they will powder easily, (avoiding however carefully such heat as may in the least burn them, or change their colour); to scrape off from these shells all the outward or other parts that may not be of the most perfect whiteness; and to levigate them well with water on the stone, and wash the powder over till thoroughly fine.

Of troy white or Spanish white.

The troy white or Spanish white is chalk neutralized by the addition of water in which alum is dissolved, and afterwards washed over.

It is used by some in water colours as a white, and may be thus prepared.

“ Take

" Take a pound of chalk ; and soak it well
 " in water. Then wash over all the fine part ;
 " and, having poured off the first water, add
 " another quantity in which two ounces of
 " alum is dissolved. Let them stand for a day
 " or two, stirring the chalk once in six or eight
 " hours ; wash then the chalk again over, till
 " it be rendered perfectly fine ; and pour off
 " as much of the water as can be separated
 " from the chalk by that means, taking off
 " the remainder of the dissolved alum, by
 " several renewed quantities of fresh water.
 " After the last is poured off, put the chalk
 " into one of the cullender filters, with a
 " linnen cloth over the paper ; and, when the
 " moisture has been sufficiently drained off
 " from it, lay it out in lumps to dry on a
 " proper board."

Of egg-shell white.

Egg-shell white is used by some in water colours ; and preferred to flake or the troy white. It may be thus prepared.

" Take egg-shells ; and peel off the inner
 " skins. Then levigate the shell to proper
 " fineness ; and wash over the powder."

CLASS IX. Of black colours.

Of lamp black.

LAMP black is the foot of oil collected as it is formed by burning. It is a brownish black : but nevertheless, being of a good texture for mixing either with oil or water, and drying well with oil, it is the principal black at present used in all nicer kinds of painting : for notwithstanding ivory black far surpasses this in colour, the gross and adulterate preparation of all that is to be now obtained has occasioned it to be greatly rejected.

The lamp black is made by burning oil in a number of large lamps in a confined place, from whence no part of the fumes can escape ; and where the foot formed by these fumes, being collected against the top and sides of the room, may be swept together and collected : and this being put into small barrels is sold for use without any other preparation.

The goodness of lamp black lies in the fulness of the colour and the being free from dust or other impurities. The lightness of the substance furnishes the means of discovering any adulteration if to a great degree : as the bodies with which lamp black is subject to be sophisticated are all heavier in a considerable proportion.

Of ivory black.

Ivory black is the coal of ivory or bone, formed by giving them a great heat ; all ac-

K

cels

cess of air to them being excluded. It is, when pure, and genuinely prepared from the ivory, a full clear black; and would be the most useful of any, in every kind of painting, but that it is apt to dry somewhat too slowly in oil. At present, nevertheless, being prepared only by those who manufacture it from bones in very large quantities for coarse uses, and sell it at an extreme low price, it is so grossly levigated, being ground only in hand or horse-mills, and adulterated moreover copiously with charcoal dust, which renders it of a blue cast, that it is wholly exploded from all more delicate purposes, and lamp black used in the place of it, though inferior, with regard to the purity and clearness of the black colour, to this when good.

As the ivory black, notwithstanding, has its merit in most kinds of painting, when its preparation is properly managed; particularly in water and varnish: those who desire to have it may prepare it themselves in perfection by the following means.

“ Take plates, chips, or shavings of ivory;
 “ and soak them in hot linseed oil; or, if filings
 “ are to be more easily procured, they may be
 “ used moistned with the hot oil. Put them
 “ into a vessel which will bear the fire; cover-
 “ ing them with a sort of lid made of clay and
 “ sand; which should be dried, and the cracks
 “ repaired before the vessel be put into the fire.
 “ Procure this vessel to be placed in a tobacco-
 “ pipe maker’s or potter’s furnace, or any other
 “ such

“ such fire; and let it remain there during one
 “ of their heats. When it shall be taken out,
 “ the ivory will be burnt properly; and must be
 “ afterwards thoroughly well levigated on the
 “ stone with water; or it should, indeed; to
 “ have it perfectly good, be also washed
 “ over.”

Those who have a calcining furnace, such as is described p. 22, may very commodiously burn the ivory in it; and the fire need not be continued longer than while the fumes, that arise from the vessel containing the ivory, appear to flame. This operation may likewise be performed in the subliming furnace described p. 15, by putting the ivory in a retort coated with the fire-lute and fixing the retort as is directed p. 32 for the sublimers: and a proper receiver being fitted to the receivers, the fumes will be detained in it, and the smell prevented from being in the least troublesome: the fire must in this case be continued while any gross fumes come over.

The goodness of ivory black may be perceived by its full black colour, not inclining too much to blue; and by its fineness as a powder.

Of blue black.

Blue black is the coal of some kind of wood, or other vegetable matter, burnt in a close heat where the air can have no access. The best kind is said to be made of vine stalks and tendrils:

drills : but there are doubtless many other kinds of vegetable substances from which it may be equally well prepared. It is, when good, a fine bluish black colour useful in most kinds of paintings for many purposes ; but is rarely to be had at present well prepared, and therefore much neglected in most nicer cases.

Those, who desire to have blue black perfectly good, may prepare it in the manner above directed for the ivory black, from the vine stalks or tendrils, or any other twigs of wood of an acid taste and tough texture, but the soaking in oil, prescribed for the ivory, must be here omitted.

The goodness of the blue black consists in the cleanness and blue cast of its black colour ; and the perfectness of its levigation, which should be managed as directed for the ivory black.

Of Indian ink.

Indian ink is a black pigment brought hither from China, which on being rubbed with water, dissolves ; and forms a substance resembling ink ; but of a consistence extremely well adapted to the working with a pencil : on which account it is not only much used as a black colour in miniature painting ; but is the black now generally made use of for all smaller drawings in chiaro oscuro (or where the effect is to be produced from light and shade only.)

The preparation of Indian ink, as well as of the other compositions used by the Chinese as
paints;

paints, is not hitherto revealed on any good authority ; but it appears clearly from experiments to be the coal of fish bones, or some other vegetable substance, mixed with isinglass size, or other size ; and, most probably, honey or sugar candy to prevent its cracking. A substance, therefore, much of the same nature, and applicable to the same purposes, may be formed in the following manner.

“ Take of isinglass six ounces, reduce it to
 “ a size, by dissolving it over the fire in double
 “ its weight of water. Take then of Spanish
 “ liquorice one ounce ; and dissolve it also in
 “ double its weight of water ; and grind up
 “ with it an ounce of ivory black, prepared
 “ as above directed in p. 130. Add this mix-
 “ ture to the size while hot ; and stir the
 “ whole together till all the ingredients be
 “ thoroughly incorporated. Then evaporate
 “ away the water in *balneo mariæ*, and cast
 “ the remaining composition into leaden
 “ moulds greased ; or make it up in any
 “ other form.”

The colour of this composition will be equally good with that of the Indian ink : the isinglass size, mixt with the colours, works with the pencil equally well with the Indian ink : and the Spanish liquorice will both render it easily dissolvable on the rubbing with water, to which the isinglass alone is somewhat reluctant ; and also prevent its cracking and peeling off from the ground on which it is laid.

C H A P. III.

Of the vehicles, dryers, and other substances used in painting for the laying on and binding the colours.

S E C T. I. *Of the vehicles, dryers, &c. in general.*

TH E qualities necessary in all vehicles (except in the case of crayons) are, that they should be of a proper degree of fluidity to spread the colour,—that they should be of such a nature, with respect to their attractive disposition, as fits them to combine well with the coloured pigments:—that they should become dry within a due time,—and that they should be capable of leaving a proper tenacious body; when they are become dry, as well to bind the colours to the ground, as to make them adhere to each other where more than one kind is used. But the combination of all these necessary qualities being to be found in no one substance, (except oil in some cases,) compositions have been formed to suit the several intentions in a manner accommodated to each particular occasion.

The principal vehicles hitherto used are oils,—water,—spirit of wine,—and turpentine;

time: but as water, and spirit of wine, alone, want the proper unctuous consistence for spreading the colours, and dry away totally without leaving any glutinous substance to bind and fix such of the pigments as are of an earthy or incohering texture, gums,—size,—sugar,—and other such viscid substances have been superadded to supply the defects and render them of due consistence and body.

Though oils simply used are a perfect vehicle of colours in some cases; yet in many others, having been found to dry too slowly, means have been sought after, by the addition of other bodies, to alter this quality in such as may be defective in it; which has consequently introduced another kind of substances into the materia pictoria; that from their being employed in the intention of remedying this fault in the oils, of not drying sufficiently fast, are called *DRYERS*. These are either ingredients of a different nature added to them, without any preparation of the oils; or part of the oils themselves, into which this quality has been introduced by the operation of heat, either in their simple state, or with the addition of the other drying ingredients: which oil, thus changed, being thence rendered capable on its commixture with other oil, to cause them to dry faster, is called *drying oil*; and frequently used in the same intention as other dryers.

As water in its simple state is for the most part incapable of being a vehicle to colours, they

being in general of an earthy or incohering texture, it is necessary to give it a more viscid consistence, and to join to it a body which will dry with such a tenacity as may bind the colours.

This is done by adding gums, size, sugar, or such other bodies as tend to inspissate and impart to the water a more clammy and thick consistence. But where the colours themselves are bodies of a gummous nature, and will dissolve or grow viscid in water, as gamboge, the juice of the buckthorn berries, or of the French yellow berries, and such others, further admixture, in the intention of a vehicle, is needless, and tends only to weaken the effect, or foul the colours.

The most usual addition where water is used in nicer paintings, is the transparent gums, such as the gum Arabic, and Senegal: and the principal reason of their preference to other bodies, which render water viscid and glutinous, lies in their suffering the mixture made of them with the colours to be instantly reduced to a working state, by the addition of fresh water, at any time, though the quantity originally used be intirely dried: by which property in the substances employed to inspissate the water, colours so prepared may be kept in a condition ready for use in shells, or other proper vessels, to any length of time. But the gums have, nevertheless, a very untoward quality, when mixed with most kinds of pigments, which is their being very liable to crack and peel off from the paper or vellum.

lum on which they are laid. To remedy this, therefore, sugar candy, or what is better, though seldomer used, honey is frequently added to them; and by some starch, boiled flower, and other bodies of a like nature.

The painting in this kind of vehicle is called *painting in water colours*, and from its being of late mostly confined to small objects, *miniature painting*: though it was till the introduction of the use of oils, which is modern, the only common method of painting in any way, since the encaustic and other methods of the antients have been lost.

For grosser paintings and purposes, water is rendered a proper vehicle by the admixture of size; which is free from that disadvantage of cracking and peeling, that attends the use of the gums: but then, on the other hand, it is unfit for nicer purposes, where only a small quantity of each kind of colour is required. For as the compositions of the vehicle and colours do, in such case, soon become dry, and those mixt with size when once dry will not again commix with water, by rubbing with a brush or pencil, as those compounded with the gums, it would be endless to employ size for such purposes; as all the kinds of colours must be fresh ground up and prepared every time there may be occasion to use them. The painting with size is, therefore, confined principally to scenes, and such large works; where it is now called *fresco painting*, I suppose from its having been at first mostly
used

used for such pieces as were intended to be placed without doors.

There are likewise particular cases where other fluid substances may be employed advantageously along with the vehicles formed by water: as in the case of verdigrise, where water failing to dissolve it, vinegar, or juice of rue, as was before mentioned, should be substituted in its place: but they are in fact only natural compounds of water, and what may be wanting to make the pigment dissolve in, or commix with it.

Spirit of wine, as a vehicle for colours, is likewise insufficient to the end without being compounded with other substances: as it wants a proper thickness or viscosity, either to suspend the pigments, or to bind and fix them to the ground when dry. It is, therefore, found necessary to dissolve in it such gummous or resinous bodies, as seed or shell lac, mastic, sandrac, or resin; which answer the same purpose here, as gum Arabic in water. A vehicle, however, formed from this mixture, has some advantages over all others; as the colours are so defended by the gummous or resinous bodies, that the most tender kinds stand very well; and retain their beauty to any length of time, if no violence impair them. The use of this kind of vehicle is called *painting in varnish*; which art has been greatly improved and extended within these few years, by the manufacturers at Birmingham; and will probably hereafter, when the conveniences

ences and advantages of it are more generally known, be applied to purposes of greater account, with respect to the species of painting.

It has been lately a practice with some eminent portrait painters, to make a compound vehicle by mixing oils and varnish together: and this likewise is, by them, called *painting in varnish*; though it ought, I think, rather to be called *painting with varnish*. The advantage that has principally induced them to use this method, is the quick drying of the colours, which is the result of it: but time will shew them another yet greater advantage in it; I mean the preservation of the colours, to which it will greatly contribute. The varnish used for this purpose must be formed of oil of turpentine: but the particular composition we shall have occasion to speak of below.

SECTION II.

Of oils in general.

OILS of a nature suited to this purpose have been the most commodious and advantageous vehicle to colours hitherto discovered; as well because the unctuous consistence of them renders their being spread and laid on more expedite than any other kind of vehicle; as, because when dry they leave a strong gluten or tenacious body, that holds together

gether the colours, and defends them much more from the injuries either of the air or accidental violence, than the vehicles formed of water. Several qualities are not, however, constantly found in the kind of oil proper for painting, which are, nevertheless, indispensibly requisite to the rendering them a perfect vehicle for all purposes; but the want of some of them can in many cases be dispensed with; and one of them, we shall first mention, remedied by art in a great degree.

The principal and most general quality to be required in oils, is their drying well; which, though it may be assisted by additions, is yet to be desired in the oil itself; as the effect of the pigments used in it are sometimes such as counteract those of the strongest dryers, and occasion great delay and trouble from the works remaining wet for a very long time; and frequently never at all becoming dry as it ought: and indeed there are some parcels of the oils which have this vice in an irremediable degree.

The next quality in oils is the limpidness or approach to a colourless state, which is likewise very material; for where they partake of a brown or yellow colour, such brown or yellow intermixes itself necessarily with the teint of the pigments used in the oil, and of consequence depraves it. But besides the brown colour which may appear in the oil when it is used, a great increase of it is apt to succeed in time, if the oil be not good: and
 I therefore

therefore this should be guarded against as much as possible, where it may be of ill consequence.

Both these qualities are, however, greatly remedied by keeping the oils a long time before they be used; and even linseed oil, tho' much the most faulty in these respects, is greatly improved by time; and sometimes rendered fit for almost any purpose whatever.

There are three changes that oils of the kind proper for painting are liable to suffer in their nature, and which affect them as vehicles, that are confounded by painters under one term, *viz. fattening*; notwithstanding they are brought about by very different means, and relate to very different properties in the oils.

The first is the coagulation before spoken of by admixture of the oils with some kinds of pigments unduly prepared. This indeed is called the *fattening of the colours*; but the real change is in the oils; and the pigments are only the means of producing them. This change is generally a separation of the oil into two different substances: the one a viscid pitchy body, which remains combined with the pigment: the other a thin fluid matter, which divides itself from the colour and thicker part. This last appears in very various proportions under different circumstances; and in some cases is not found at all, where the pigment happens to be of a more earthy and alkaline nature: for then only a thick clammy substance,

substance, that can scarcely be squeezed out of the bladder, if it be put up in one, is the result of the fattening. This fattening not only succeeds when the oil and pigments are mixed together, and kept for any length of time in bladders or otherwise; but even sometimes after they have been spread or laid on the proper ground: when, instead of drying, the separation will happen; and one part of the oil will run off in small drops or streams, while the other will remain with the colour without shewing the least tendency to dry.

The second is a change, which happens in oils from long keeping, by which they grow more colourless, become more ready to dry, and acquire a more unctuous consistence. In this case the *oils* are said to become *fat*; tho' they are in a very different state from that above mentioned, which is caused by unsuitable pigments: for when this change does not exceed a certain degree, it is, as I before said, every way a great improvement of the oils.

The third is a change produced by artificial means, from exposing the oil a long time to the sun and air, (of the particular manner and use of which we shall speak more fully in its proper place) whereby it is freed from its grosser and more feculent parts, and rendered colourless and of a more thick and less fluid consistence, than can be produced by any other treatment: but at the same time made more reluctant to dry, particularly with ver-

million, lake, Prussian blue, brown pink, and King's yellow; and indued with other properties that disqualify it for common use as a vehicle in painting. These qualities, nevertheless, may be rendered advantageously subservient to some particular purposes: though the nature, and even the preparation of fat oil is less understood at present than one could imagine it possible, with regard to a substance of so much consequence, both to some kinds of painting, and several other kindred arts. Oils in this state are called also *fat oils*; tho' it is a change that has not the least affinity with either of the others; but, on the contrary, differs oppositely from both of them in some very essential circumstances.

In speaking therefore of the fattening of oils or colours, attention should be had to the not confounding these three several kinds, one with another; which can scarcely be avoided in some cases, but by considering the occasion where the term is used, and judging from the circumstances which kind is meant.

These are the several qualities by which oils are rendered suitable to, or improper for the purposes of painting. When they dry quickly, are colourless, (especially through age,) and are somewhat fat in the second of the above senses of that word, they are perfect with respect to the wants of painters: where they dry, tho' more slowly, they may, nevertheless, be improved to a tolerable state by additions: and where they are discoloured, they may serve for
some

some uses ; but where, as is frequently found, they will dry only in a great length of time, or not at all, they are absolutely unfit for this application.

S E C T I O N III.

Of particular oils.

Of linseed oil.

LINSEED oil is expressed from the seed of line, by those who manufacture it in large quantities, and have mills turned by water for the more expeditious dispatch of the work : it is the principal oil used in all kinds of paintings ; or, indeed, the only kind, except for some very nice purposes, where its brownness renders it unfit. The general defects of linseed oil are this brown colour, and a tardiness in drying ; both which are in a much greater degree in some parcels than others ; and there is sometimes formed such, as, in consequence of its being commixed with the oil of some other vegetable (accidentally growing with it) that partakes of the nature of olive oil, cannot be brought to dry by any art or means whatever.

The goodness of linseed oil, therefore, consists in its nearer approach to a colourless state ; and in its drying soon. Its state, with respect
to

to the first quality, may of course be distinguished by inspection only: but the latter can only be discovered by actual trial of it; for there is no particular appearance, or other perceptible mark, attending this quality.

Linseed oil is in general used without any other preparation than the mixing it with the proper dryer: but the keeping it a considerable time before it be used, will always be found to improve it. It is, nevertheless, used sometimes, after it is prepared into the state of drying oil, not to commix and make other unprepared parcels dry, but alone, as the sole vehicle of the colours. The convenience of this is the speedy drying of the paint so composed; but it cannot be practised where the beauty of the colour is of the least consequence; for the oil imparts in this case a very strong brown to the mixture.

Of nut oil.

Nut oil is the oil of walnuts pressed out of the kernels by means of a screw-press. It is used for the mixing with flake white, or other pigments, where the clearness of the colour is of great consequence, and would be injured by the brownness of linseed oil.

It is used without any other preparation than keeping, which is always of advantage to it, both with regard to its colour and quality of drying.

The faults of nut oil, when not good, is the being turbid, and not perfectly colourless; and the drying too slowly: the first shews itself; but the other must be examined by trial. If, however, there be no adulteration in the case, time will generally cure it of all these defects.

Whoever would have nut oil perfectly good, should peel off the skin of the kernels before they be pressed, in the same manner as when they are eaten: for the skins contain an acrid oil of a very different nature from that of the white substance of the kernel; which is extremely subject to turn brown, or even black; and consequently tinge the other when commixt with it.

Of poppy oil.

Poppy oil is expressed from the ripe seeds of poppies, in the same manner as nut oil from the walnuts. Its qualities and uses, as likewise its defects and the remedy for them, are also much the same as those of the nut oil: only when it is perfectly good, it is more clear and limpid, and will dry better than the best nut oil whatever.

Oil of spike and lavender.

Oil of spike or lavender are essential or distilled oils, obtained by distilling the spike or any other lavender, with water. It is

used in painting only as the vehicle for laying on the composition formed of the flax and colours in enamel painting; which by its fluidity it renders capable of being worked with a pencil; its volatile nature afterwards making it wholly dry away without leaving any matter that might affect the substances of the enamel; which would be otherwise, if any but an essential oil were used.

Oil of spike or lavender is subject to be adulterated by the oil of rosemary; which, though much of the same nature, yet being of a less unctuous or thick consistence, is not so well adapted to make the colours spread and work well with the pencil. This adulteration is not easily discoverable, where it cannot be distinguished by the smell; and the best method therefore to be certain of the goodness of the oil of spike or lavender for this purpose, is to make an actual trial of it.

SECTION IV.

Of particular dryers.

Of drying oil.

DRYING oil is formed of linseed oil, prepared by the means of boiling, sometimes with the addition of other substances, and sometimes without. The substances add-

ed to oil, in this preparation, are very various; there being many different recipes in the hands of different persons; some of which prescribes a less number of ingredients, and others almost every kind. These substances are, white vitriol, sugar of lead, seed lac, gum mastic, gum sandarac, gum animi, gum copal, umber, colcothar, litharge, and red lead. But the first eight of these articles being dearer; when great quantities of drying oil are prepared for common purposes, they are usually omitted; and the others, or some of them, only employed: and indeed if the linseed oil be good, and boiled for a proper time even alone, it will have nearly the same properties, as if the most efficacious of these substances be added to it. I will, however, give two of the most approved recipes for preparing drying oil, with the addition of the usual ingredients. The one for the kind supposed proper for the more nice and delicate painting: the other for common work.

“ Take of nut or poppy oil one pint, of
 “ gum sandarac two ounces, of white vitriol and sugar of lead each one ounce
 “ Boil the whole, till the solid ingredients be dissolved, and the mixture be of the colour
 “ of linseed oil.”

This oil will dry fast; and, mixed with an equal quantity of nut oil, and the proportion of oil of turpentine each person may find more convenient to use, will render any other capable of drying well without the least hazard

of fattening, however disposed to it: and it may be, therefore, used for all nicer purposes, where common drying oil would be injurious by the brownness of its colour.

Drying oil may be well prepared for coarser work according to the commonly approved method, in the following manner.

“ Take of linseed oil one gallon, of litharge
 “ of gold or silver one pound, of white vi-
 “ triol half a pound, of sugar of lead, gum
 “ Arabic, and umber, each a quarter of a
 “ pound. Boil them so long as the discolour-
 “ ing the oil, which is the gradual conse-
 “ quence of the boiling, will permit it: for
 “ the oil must not be burnt till it approach
 “ too near to blackness.”

The drying oil prepared in a simpler man-
 ner, as by those who make it for sale, will
 not differ much from the above in its qualities,
 though it be prepared as follows.

“ Take linseed oil one gallon, red lead one
 “ pound and a half. Boil them so long as the
 “ colour will bear it.”

This last may be much improved by the
 addition of gum sandarac; and will then be
 perhaps more useful than the more complex
 and expensive composition above given. In-
 deed a gallon of linseed oil, in which two
 pounds of gum sandarac, and one pound of
 gum Arabic has been dissolved, is the drying
 oil I would recommend for common purposes;
 and it need not be boiled near so high as that
 sold in the shops; for, as the gums give it a very
 L 3 considerable

150 OF THE SUBSTANCES

considerable body, the colours may be brought to a proper state for working by a little of this with a larger proportion of spirit of turpentine, either with or without the addition of unprepared oil ; and consequently the proportion of brown given to the colours is less, than where a greater quantity of the oil must be used.

The drying oil of any kind may be boiled in an earthen pipkin, or iron pot : but great care must be taken in the operation, if it be performed within any building, that the matter do not boil over ; which, when it happens, greatly endangers the firing such building. It is therefore much better, especially where any larger quantities are made, to have an iron furnace that can be moved about, or to build an occasional one of bricks ; which, for this purpose may be done without mortar ; and need only be a cylinder of bricks, in which a frame with bars to support the fuel is fixed, with a hole about eight inches above the bars for feeding the fire, and another in the highest part of the hollow for venting the smoke.

When the drying oil is taken off the fire, it may while yet hot be strained through flannel ; but if umber, or any ingredients which will not dissolve, are added to it, it should first stand to settle, that the clearer part may be poured off from the grosser : and, after straining, if any sediment appear, the oil should be again decanted off from it, and the foul part heated and passed again through the flannel.

of

Of oil of turpentine.

Oil of turpentine is distilled from turpentine. It is an ethereal oil, which quickly exhales in the air ; and if mixt with linseed, nut, or poppy oils, in flying off carries with it the more volatile part of such oils, and causes them to dry much sooner than they would otherwise. On this account it is very generally used as a dryer to mix with the other oils : for which purpose it has greatly the advantage over drying oil, with regard to colour, as it is perfectly transparent and white.

It is used without any other preparation than mixing it, either alone or together with drying oil, with the other oils and colours : and it is not subject to any adulteration, except the dissolving crude turpentine or resin in it ; which do not greatly injure it with regard to this application of it : such adulteration may, however, be perceived, when in a greater proportion, by a slight degree of yellow colour and glutinous consistence, the unsophisticate being quite limpid and without the least tenacity ; and every degree may be discovered by evaporating part of what is suspected with a very gentle heat, when a resinous or terebinthinate substance will be left behind, if any such have been mixt with the oil.

Of sugar of lead.

Sugar of lead is a chemical preparation of lead, by dissolving it in vinegar, and reducing the salt, formed, to chrystals by evaporation: but it is to be had so constantly, and at so much less expence at the shops of chemists and druggists, than it can be made in small quantities, that it is needless to give any more particular recipe for the making it for the purposes of painting. It is supposed to have a quality, when mixt with oils, of rendering them much more prone to dry: and on that account is very frequently used, as well in the making drying oil, as in the common use of the oils, where it is ground up with them together with the colours. It requires no other treatment, but to be well commixt with the oil with which it is used: and it is not subject to any adulteration if it be obtained in its chrystalline form and not powdered, for there the appearance alone is sufficient to shew whether it is clear from any mixture of heterogeneous matter.

It is, notwithstanding, the general confidence which painters have in this substance as a dryer, dubious whether the use of it, except in the preparation of drying oil, answers in any material degree the end: for though it may assist the heat in producing that change in oils which renders them drying oil, yet it does not necessarily follow, that any such effect is produced by it without heat: though it
is

is very probable, that the supposition of **this** has been the occasion of its being introduced into practice, as a dryer that will operate on oils by barely mixing it with them.

Of white vitriol.

White vitriol is a mineral substance found in Hungary, and many other places. It is used in the same manner, and for the same purposes, in painting, as sugar of lead; with which it is generally joined in practice, both in the making drying oils, and the admixture with the common oils and colours. It is not liable to be adulterated, on account of its low price: but it has not been unusual to sell common green vitriol or coperas calcined to whiteness in the place of it: and as they are very different substances, this ought to be guarded against. Those who are acquainted with the appearance of both may easily distinguish them by view; but others may make themselves certain they are not imposed upon in this particular, by putting a small piece into the fire on a poker, or by any other method; when, if the parcel in question be true white vitriol, no redness will come upon it; but, if it be the green vitriol calcined to whiteness, it will turn red by this greater heat, and have the appearance of Indian red, or brown oker.

What was said of the dubiousness of the efficacy of sugar of lead as a dryer, except in the preparation of drying oil, holds equally good

good with respect to white vitriol : though from a strong persuasion of the contrary, it is used very generally, and in a large proportion.

SECTION V.

Of the substances used for rendering water a proper vehicle for colours.

Of gum Arabic.

GUM Arabic is a transparent gum brought from Africa and the Levant, that is easily soluble in water, which it renders viscid. From these qualities, and the drying with a considerable degree of tenacity, it is the best ingredient, for making an aqueous vehicle for colours, hitherto known. When good, however, as it is apt to become perfectly dry, it is subject to crack and separate from the cartoon or grounds, on which the colour is laid with it : from whence some mixture becomes necessary to remove this defect.

The goodness of gum Arabic must be concluded from its transparent whiteness, the being perfectly dry and brittle, and free from all dust and heterogeneous matter. Gum Senegal, which is of lower price, is frequently sold for it : but this fraud may be easily guarded against, by taking care to observe, that it be not soft and clammy ;

clammy ; which qualities are always in some degree found in gum Senegal.

There is no other preparation necessary for gum Arabic, previously to being used with the water, except powdering it in order to its dissolving the more easily : only it is proper to pick out all brown and discoloured pieces, or any foulness that may accidentally be in it.

Of gum Senegal.

Gum Senegal is much of the same nature as gum Arabic; and applicable to many of the same uses : but it is apt to retain some proportion of moisture, which consequently renders it more soft and clammy. This property makes it, when alone, a less fit ingredient for a vehicle for water colours than gum Arabic: but yet, nevertheless, a third or fourth part of the gum Senegal, mixed with the gum Arabic, will greatly improve it: for, as the gum Senegal is too slow and reluctant to the drying perfectly, so the gum Arabic on the contrary dries in too great a degree ; and a due mixture of them therefore produces the proper medium or temperament betwixt the two extremes.

The treatment of the gum Senegal, when used in a vehicle for water colours, must be in all other points the same as the gum Arabic.

Of

Of size.

Size is made of leather boiled in water till it become of a viscid consistence.

It is a very proper ingredient for a vehicle for colours used in water in larger works : but its reluctance to be redissolved after it has been mixed with colours, and is become dry, renders the employing it incommodious in miniature painting. Size is commonly prepared in great quantities by those who make a trade of manufacturing it, together with glue, from all refuse pieces of leather and skins of beasts : but where it is wanted for painting for nicer purposes, it should be prepared from the cuttings and shreds of the glovers in the following manner.

“ Take any quantity of the shreds or cuttings
 “ of glovers leather ; and put to each pound
 “ a gallon of water : boil them six or eight
 “ hours, recruiting the water so that it shall
 “ not diminish to less than two quarts. Then
 “ take it off the fire ; and strain the fluid thro’
 “ flannel while hot : and afterwards evapo-
 “ rate it again, till it become of the consist-
 “ ence of a jelly when cold.”

Of sugar and sugar candy.

Sugar, and white sugar candy, are used as ingredients to render water a vehicle for colours in miniature painting. The intention of them
 is

is to prevent the colours from cracking when mixed with gum Arabic; which the sugar prevents by hindering that perfect dryness, and great shrinking, which happens on the use of gum Arabic alone: and also to make the gum water work more kindly with the pencil. There is no preparation of the sugar and sugar candy necessary before they be used, except powdering, to make them melt the more easily.

Starch.

Starch is sometimes used instead of sugar-candy for mixing with the colours that are used in strong gum water, to make them work more freely, and to prevent their cracking. It is a kind of secret with some persons, who lay a considerable stress upon it.

Of isinglass.

Isinglass is a glue formed from the cartilages of a large fish, which is found in the rivers that flow into the northern seas. It is used in miniature painting, in the same manner as the gums Arabic or Senegal, for rendering water a proper vehicle, by giving it a due viscosity for spreading and binding the pigments of an earthy texture.

SECTION VI.

Of the substances used to render spirit of wine a vehicle for colours.

Of seed lac.

SEED lac is a substance formed on the boughs of trees by small flies, as their nidus or habitation. It dissolves in spirit of wine; and being left dry again, by the evaporation of the spirit re-attains its original hard and tough texture. It is therefore extremely beneficial in defending and securing colours from any injuries, the air or slight violence might do them: but the brownness of its colour, and its not rendering the spirit of wine in which it is dissolved of a consistence sufficiently thick and viscid to suspend the powdered pigments when they are commixed with it, are defects which greatly destroy its value as an ingredient for making spirit of wine a proper vehicle for colours. It may, however, be improved for this purpose by the addition of turpentine, and other substances: as we shall observe in its due place.

The goodness of seed lac consists in its approaching towards a transparent colourless state; and being free from heterogeneous matter and opaque parts: for, as the brownness is its greatest defect, the diminution of that quality consequently enhances its value.

The

The preparation of seed lac, for mixing with the spirit of wine, is to pick out, or wash from it by means of water, all the little woody or other feculent parts; and then to powder it grossly: for if it be reduced to a fine powder the whole will run together, and cohere, so as to hinder the spirit of wine from commixing with the particles and dissolving them. Those who want seed lac for using with colours, where whiteness or brightness are demanded, must pick out the lightest coloured grains; and use them only; reserving the browner for coarser purposes.

Of shell lac.

Shell lac is a substance brought hither in very thin pieces; and partaking greatly of the nature of seed lac: from which nevertheless it differs so much in some properties, as clearly shews they are not the same substance under a different form, as has been supposed by many. Shell lac dissolves in spirit of wine as well as seed lac; but never becomes perfectly clear and transparent. To compensate however for this defect; it renders the spirit much more viscid, and capable of keeping the colours suspended: from whence it derives a considerable value in this kind of painting.

The goodness of shell lac consists in its approaching to transparency and whiteness; but it is never found without a great degree of brownness. There is no more preparation of shell

shell lac than seed lac required previously to its being used for this purpose with spirit of wine; the reducing it to gross powder being the whole.

Of turpentine.

Turpentine is capable of dissolving in spirit of wine, and giving it a viscid consistence; on which account it is sometimes used along with other bodies to render the spirit a fit vehicle for colours. A composition formed of it with mastic, sandarac, resin, and in some cases seed lac, will serve for purposes where the painted body is not subject to great rubbing, or any violence: but with respect to hardness and durableness, all such compositions fall far short of the solution of shell lac.

Turpentine must be chosen by its clearness and purity: and requires no preparation previously to its being applied to this purpose.

Of the gums mastic and sandarac.

The mastic and sandarach are much of the same nature; and applied to the same purposes with regard to painting. They are gum resins intirely white and transparent when good; and dissolve perfectly in spirit of wine: on which accounts they are used for rendering spirit of wine a vehicle for colours: but they are of so soft a nature, and so ready to melt with a slight heat, that the colours laid on with them would
fully

fully and be injured even by a gentle handling. On this account they require to be mixed with seed lac: and, to inspissate the mixture sufficiently to suspend the colours, some turpentine is also necessary.

Mastic and sandarac must be chosen for their whiteness and transparency: and require no other preparation for this use of them, than to be well picked and powdered.

Of resin.

Resin is the caput mortuum or residuum left in the distillation of turpentine for extracting the oil. It is of two kinds, white and brown: the white is made when the turpentine is distilled with water; the brown when no water is added to it. The white turpentine is used for rendering spirit of wine a vehicle for colours in the same manner as mastic or sandarac; with which it agrees in its qualities, except that it is yet less hard and more liable to smudge on handling: and the same preparation and treatment is required for it as for them.

C H A P. IV.

Of the manner of compounding and mixing the colours, with their proper vehicles for each kind of painting.

SECT. I. *Of the colours proper to be used with oils, and the manner of compounding and mixing them with the oils and dryers.*

THE colours proper to be used in oil, for *red*, are, vermilion, native cinnabar, lake, scarlet oker, common Indian red, terra de Siena burnt, (and mixt with white), red oker, Spanish brown, Venetian red and red lead :— for *blue*, ultramarine, Prussian blue, ultramarine ashes, verditer, indico, and smalt;— for *yellow*, King's yellow, Naples yellow, yellow oker, Dutch pink, light pink, masticot, common orpiment, terra de Siena, unburnt and mixed with white, and turpeth mineral;— for *green*, terra verte, verdigrise, distilled verdigrise, or chrystals of verdigrise, and Prussian green;— for *purple*, true Indian red;— for *brown*, burnt terra de Siena (unmixed with white,) brown pink, brown oker, umbre, and asphaltum;— for *white*, white flake, and white lead;— for *black*, lamp black —
ivory

ivory black, and blue black: these are all the colours which are at present in use for oil painting in this country; and when they are perfect in their kinds are fully sufficient to answer every purpose. The immediate preparation of them, and the manner of compounding them with the oils and dryers may be managed thus.

Okers of every kind, as also all the earthy and metallic bodies, in which are included ultramarine and its ashes, ought to be well levigated by a good stone and muller, with water; and washed over, before they be mixed with the oils, when they are intended for more delicate purposes: and lake, brown pink and Prussian blue, which being of a gummy or glutinous nature, would again acquire a cohesion if levigated in water, may be ground to an impalpable powder by adding spirit of wine to them instead of the water, in which state they will then continue when they again become dry; and be much more easily and thoroughly commixed with the oils. Lamp black demands no preparation; nor does the asphaltum require to be commixed with oil; but with spirit of turpentine to thin it, if it be of too thick a consistence to work with the pencil.

In levigating lake or any of the pinks, as also King's yellow, Naples yellow, or verdigrise, with water or spirit of wine, great care must be taken not to use a knife or other iron implement; which would greatly injure the colours.

lours. Instead of such knife, a thin piece of horn may be employed to take the colours off from the stone, or to scrape them together as they are grinding: and caution should likewise be used with regard to the boards on which they are dried; and the place where they are repositied during the drying: for the sun or dust will be very apt to deprave some of them in this state, if they be not well kept out.

The pigments being thus duly prepared may be ground with the oils, either on a stone or muller, when they are wanted in greater quantities; or are intended to be kept; or by the pallet-knife, on the pallet, where they are immediately to be used: but they should be perfectly mixed; or the oil will be apt to separate, and the colours fail of their due brightness and effect. For convenience the colours designed for the nicer kinds of painting, after they are ground with the oil, are put into pieces of bladders; and tied into a kind of ball; in which state such as be perfect will continue good a long time; and the bladder being prickt and squeezed, the colour is forced out by small quantities, as is required for use.

For coarser work, the colours demanded in great quantity are ground by hand or horse-mills with the oil; and the others on a stone with a muller. After which, they are put in pots; and mixed there with oil of turpentine and drying oil, according to the particular purposes to which they are employed.

Vermilion,

Lake, Prussian blue, brown pink, King's yellow, and sometimes vermillion, are apt to be backward in drying; and require, therefore, to be mixed with oil that is old and well disposed to dry; and where brightness is requisite, the nut or poppy oil should be used with oil of turpentine: but where the brightness is of less moment, old linseed oil with a third of drying oil, and the same proportion of oil of turpentine, may be substituted. But the proportion of these, and all dryers, must be adequated to the occasion, as discretion may dictate, according to the quicker or slower disposition of the pigments used; and the time that may be conveniently allowed for them to dry. Flake white should be also used with nut or poppy oil only; and to these oils many add white vitriol and sugar of lead, as well as the oil of turpentine, when they are to be used with this or other pigments that are too slow in drying; but the effect of those substances, when used in this manner, is very dubious, as I have observed before.

SECTION II.

Of the colours proper to be used in painting in miniature or with water ; with the manner of mixture or composition of them with their proper vehicles.

THE colours used in what is called miniature painting, or with water, are, for *red*, carmine, lake, rose pink, vermilion, red lead, scarlet oker, common Indian red, red oker, Venetian red, Spanish brown ;—for *blue*, ultramarine, ultramarine ashes, Prussian blue, verditer, indico, Sander's blue, smalt, blue bice, and litmus ;—for *yellow*, gamboge, Naples yellow, Dutch pink, English pink, gall stone, masticot, French berry wash, turmeric wash, and tincture of saffron ;—for *green*, sap green, verdigrise, distilled verdigrise, and terra verte ;—for *purple*, true Indian red, archal, and logwood wash ;—for *brown*, bistre, umbre, brown oker, Cogn earth, and terra Japonica ;—for *white*, flake white, white lead, calcined hartshorn, pearl white, troy white, and egg-shell white ;—for *black*, Indian-ink, lamp-black, ivory black, and blue black.

As water is a much less kindly substance for the spreading and working colours than oil so there is a variety of treatment necessary for rendering it a proper vehicle for the different substances that are to be used with it : and
whoever

whoever, therefore, would have a complete set of water colours, must not attempt to procure them by one general method of management, as in the case of oil, for all indiscriminately; but must attend to the nature of each, and accommodate to it such a composition of the water, and what else may be necessary to give it a due consistence, as may best suit each, kind. This restriction, nevertheless, should be always observed, that nothing be used in the composition of water colours, however well it may make the colours work at the first admixture, but what will again, even though the composition become perfectly dry, so dissolve and soften on the addition of a fresh quantity of water, as, by rubbing with the pencil, to regain the fluid state, as on the first mixture, and to suffer the colour to work equally well as then. The best systems for the admixture of the variety of water colours hitherto given to the public having been defective in some material particulars, and the principal reason of it having been their confining themselves to the use of gum water, and omitting that of isinglass size, I shall be the more explicit in the directions I shall give for the management of each kind; and am satisfied that whoever follows what I advise, will find themselves under no difficulty in using all the variety of colours, that are proper to be commixt with water. But in order to avoid the repetition of the same thing in many places, it is proper first to shew the manner

of preparing properly the gum water, and isinglass size. The gum water may be thus prepared.

“ Take three quarters of an ounce of gum
 “ Arabic, and a quarter of an ounce of gum
 “ Senegal. Powder them; and then tie them
 “ up in a linnen rag; leaving so much unfilled
 “ room in the bag, as to admit its being flat-
 “ ned by the pressure of the hand. Having
 “ squeezed the bag till it be flat, put it into a
 “ quart of hot water; and there let it con-
 “ tinue, moving it sometimes about, and stir-
 “ ring the water, for about twenty-four hours.
 “ The gums will then be dissolved; and the
 “ bag must be taken out: and the fluid being
 “ divided into two parts, to one half of it add
 “ a quarter of an ounce of white sugar-candy
 “ powdered; keeping the other in its pure
 “ state. By this means, a strong and weak
 “ gum water, each proper for their particular
 “ purposes, will be obtained.”

The following method is the most advisable for the making the isinglass size.

“ Take half an ounce of the beaten isin-
 “ glass and a pint and half of water. Boil
 “ them till the isinglass be wholly dissolved;
 “ and then strain the fluid while hot through
 “ a linnen rag. Divide the size thus made
 “ into two parts: and to one of them add an
 “ equal measure of hot water: by which
 “ means a strong and weak size will be like-
 “ wise obtained.”

Having

Having thus prepared the gum water and size, a proper assortment of muscle shells, or small ivory dishes, must be suited to the colours; accommodating the size of each to the due proportion of each kind of colour: it being proper to mix up a much greater quantity of white, bistre, and the coarser sorts, than of carmine, ultramarine, and lake; as the last are to be sparingly used, on account of their great price, and are only necessary for the lights and higher touches in the objects of the same colour. A very smooth China or Dutch tile must be provided: as also a small ivory pallet knife: for though an iron one might be employed for some purposes; yet it is so noxious and injurious to the colours in other cases, that the use of it is best rejected for the whole.

Vermilion, ultramarine, ultramarine ashes, red lead, scarlet oker, common Indian red, true Indian red, yellow oker, Venetian red, brown oker, verditer, indico, masticot, umbre, terra verte, Sander's blue, bice, Cologne earth, white lead, calcined hartshorn, ivory black, and blue black, having been previously well ground and washed over, must be mixed on the tile with the pallet knife, with as much of the strong gum water as will bring them to the right temper to work with the pencil; and, while they are yet wet, they must be scraped from off the tile, and spread with the finger in the shells intended for them: where they will be ready for use at all times, on moistning them duly with a little fresh water rubbed upon them by the finger or pencil.

Prussian

Prussian blue lake, and Naples yellow, if it be used, should be first reduced to an impalpable powder ; which may be best done for this purpose by levigation on the stone in spirit of wine : and then they, as also carmine, bistre, Dutch pink, and English pink, should be well mixed, by grinding on the tile or pallet, with the ivory knife, with as much of the weaker gum water before mentioned, as will bring them to a proper consistence. After which they should be disposed of in their proper shells, as was before directed for the other.

Gamboge, Indian ink, sap green, gall stone, and terra Japonica, as they become of a viscid and adhesive nature when wet, require no gum water ; but should be only moistned and rubbed on the shells till the surface be incrusted with a proper quantity : which, by the addition of a little water, may be worked off with the pencil in the same manner as the other colours.

Verdigrise, though used with water colours, cannot, nevertheless, be brought to a proper state for working by means of water. The method of rendering it fit to be used in water colours, is to powder it ; and then pour on it a quantity of vinegar, in the manner before directed for the making the chrystals of verdigrise : which vinegar, when it has dissolved as much of the verdigrise as it can take up, must be poured off free from the settlings or undissolved part of the verdigrise ; and must be put into a bottle to be kept for use. The kind.

kind of bottles the most fit for using with this, or the following substances, in miniature painting, would be a small sort of such as are made for ink bottles ; in which the wideness of the neck, and the shallowness of the body, make it easy to dip the pencil ; and the broadness of the bottom, proportionably to the height, prevents their being so liable to be thrown down, as those of any other form. The verdigrise may likewise be prepared for miniature painting by means of the juice of rue ; which being poured on the verdigrise, after it is well powdered, will dissolve it in the same manner as vinegar ; and render it fit for use by the same treatment. The verdigrise thus dissolved becomes a truer green than when vinegar is employed ; and it is much better adapted to miniature painting in this state ; for, as the juice of rue has not the acid quality of the vinegar, it does not, like it, change or destroy several of the other colours, particularly the litmus blue, and archal ; and is therefore greatly preferable. For indeed the solution of verdigrise, though a very good green wash, is not to be used with a variety of other colours without great care : and for this reason sap green for the most part is chosen to supply its place.

The litmus blue must likewise undergo a preparation by other means than the addition of water, before it be fit to be used in miniature painting. The most approved method of which is as follows.

“ Take

“ Take an ounce of litmus : and boil it in
 “ small beer wort, till there remain only a-
 “ bout one fourth of the fluid ; strain it then,
 “ while boiling hot, through flannel : and,
 “ when it is cold, being then of a glutinous con-
 “ sistence, add as much warm water to it as
 “ will bring it to due fluidity for working.
 “ This must be used in the same kind of bot-
 “ tle as the verdigrise.”

Archal, the yellow berry wash, and turme-
 ric wash, logwood wash, and tincture of saffron,
 need no other preparation than has been be-
 fore mentioned in their original production :
 but they must be put in the same bottles ; and
 used as the solution of verdigrise and litmus
 blue.

Gamboge, Indian ink, sap green, gall stone,
 and terra Japonica, as they really dissolve and
 become transparent in water, are true washing
 colours ; as are also those last mentioned, which
 are to be in a fluid form. But neither the ver-
 digrise, litmus, or the yellow washes, are safely
 to be used for glazing over other colours ; as
 they are either liable to suffer themselves by
 such treatment, or to do injury to those they
 are laid upon.

Carmine, ultramarine, and bistre, are also
 used as washing colours ; as they will have an
 effect of that nature when spread very thin ;
 but they are not, nevertheless, properly speak-
 ing, washing colours, as they are in fact opaque.

As the producing this effect of washing is
 of great use, as well in miniature painting,

as

as in the colouring of prints and maps, I will here impart a method by which the end may be compassed in a very serviceable degree, even in the case of vermilion, red lead, Prussian blue, lake, or even the most opaque colours. This is to be done by mixing the pigments, I have before directed to be compounded with the strongest gum-waters, with the strongest kind of ising-glass size above mentioned; and to substitute likewise the weakest size, in the place of the weaker gum-water, for the colours where that is ordered. So prepared, the heavier colours will work and spread, as well as carmine, bistre, or any other substances, except those wholly fluid; and may be used with great convenience and advantage, not only where washing colours are wanted, but likewise for shading, touching, and finishing, or any of those purposes where the free working of the colours is particularly requisite in miniature painting. In the Prussian blue, lake, &c. it is proper, however, in order to prevent their cracking, to add sugar candy or honey to the size, in the proportion of half the weight of the ising-glass; in which case they will be found to work more commodiously in this vehicle than any other formed of water. Of which advantage the Chinese are so sensible, that all their other compositions for using colours in water seem to be of this kind, as well as that most useful one called *Indian ink*.

SECTION III.

*Of the colours fit to be used in fresco ;
or, painting with size ; and the
manner of mixing or compounding
them with the proper vehicles.*

B*Y* fresco painting was originally meant all paintings on walls, or other parts of buildings exposed to the open air ; but at present it signifies in common language the grosser paintings in water, where size is used. The same colours which are employed in miniature painting, may be used in this kind with size : only this method being principally confined to scenes and grosser sorts of work, where the effect depends more on the perspective art and the opposition of the colours, than on their brightness, the dearer kinds are wholly omitted, or sparingly used.

The best method of compounding the colours with the vehicles, is to mix the size in water ; then to levigate the colours in part of it ; and afterwards to put each kind in a proper pot ; adding as much more of the melted size as will bring it to a due consistence for working ; and mixing the whole well together in the pot with a proper brush, or wooden spatula. If the quantity of water originally put to the size, do not render it sufficiently fluid for grinding the colours, the fault may be

2

easily

easily remedied by adding warm water to it; and the same may be done likewise, if, after the mixture of colours, the whole be found too stiff for working.

The compositions of the colours and size must be prevented from drying, by tying bladders over the pots, or some other such means; for when once they are grown dry, they cannot be brought again to a working state without difficulty and trouble.

Though the grounds and the laying in, and grosser parts of this kind of painting, be done by this mixture of the colours with size; yet in higher finished works, that require the finer colours, the more delicate parts may be best executed by using the gum-waters or ising-glass, as above directed in miniature painting: by which means the mixing up greater quantities of the dear colours may be avoided, though otherwise necessary; as it is impracticable to keep minute quantities from drying; which, in the size, renders them unfit for working, till they are again reduced to proper condition by means of heat; but, in the others, is not attended with the least inconvenience.

SECTION IV.

If the colours proper to be used in varnish painting; and the manner of mixing and compounding them with the proper vehicles.

IN painting in varnish, all pigments or solid colours whatever may be used: and the peculiar disadvantages, which attend several kinds, with respect to oil, or water, cease with regard to this sort of vehicle: as they are secured by it, when properly managed, from the least hazard of changing or flying; and will all work well, provided they be previously reduced to the state of an impalpable powder.

The preparation of colours for this use, consists, therefore, in bringing them to a due state of fineness: this may be best done by grinding on the stone, such as are of cohering texture, as lake, Prussian blue, indico, verdigrise, and distilled verdigrise, in spirit of wine, or oil of turpentine; which last I think the better of the two for this use: but all the okers, or other earthy substances, together with vermilion, red lead, and turpeth mineral, require only to be previously well washed over; and carmine, ultramarine, and King's yellow, are necessarily in a due sta

when well prepared in their original manufacture.

The best composition of varnish for spreading and penciling the colours, with respect to the convenience of working, and the binding and preserving of them, is shell-lac with spirit of wine; which, when judiciously managed, gives such a firmness and hardness to the work, that if it be afterwards further secured with a moderately thick coat of seed-lac varnish, it will be almost as hard and durable as glass; and will bear any rubbing, or wear, or even scratching with a sharp pointed instrument, almost as well as enamel. The manner of preparing the shell-lac varnish is as follows.

“ Take of the best shell-lac five ounces.
 “ Break it into a very gross powder: and put
 “ it into a bottle, that will hold about three
 “ pints or two quarts. Add to it one quart
 “ of rectified spirit of wine: and place the
 “ bottle in a gentle heat; where it must continue two or three days; but should be frequently well shaken. The gum will then
 “ be dissolved: and the solution should be
 “ filtered through a flannel bag: and, when
 “ what will pass through freely is come off,
 “ it should be put into a proper sized bottle;
 “ and kept carefully stopped up for use: and
 “ the bag may then be pressed with the hand
 “ till the remainder of the fluid be forced out;
 “ which if it be tolerably clear, may be employed for coarser purposes, or kept to be
 “ added

“ added to the next quantity that shall be made.”

The shell-lac varnish being thus prepared, a proper quantity of it must be put into small phials of a long form; or into small tin vessels nearly of the form of glass-phials; but in such proportion, that they may never be filled above two thirds; and the colours must be added very gradually, and well shaken with the varnish as each quantity is put in, till the proportion appear fit for working; which must be known by trying with a pencil: and, if the varnish appear too thick, the fault must be remedied by the adding a little rectified spirit of wine; which will at any time immediately dilute the mixture to any degree. The phials, or tin vessels, in which the colours mixt with the varnish are kept, must be always securely stoppt to prevent the exhalation of the spirit; and they may be preserved in a working state in that manner for almost any length of time: but they must be always well shaken before they be used; as well as during the time of using at proper intervals; otherwise the colour will be apt to settle to the bottom.

This is by much the best method hitherto found out of painting in varnish: the shell-lac not only rendering the spirit of wine capable of suspending the colours much better than any other composition of this nature: but giving them tenacity and hardness, that would render paintings on copper almost eternal, if not injured by fire or some extraordinary

nary violence: and it were to be wished, that in very elaborate works, this method had been always pursued instead of painting in oil; which is subject to so many accidents from slight external violences, besides the decay and injurious change which the oil and colours suffer from their own internal nature, and the improper means of cleaning, that few pictures or paintings of older date are to be found perfect.

There are, however, other compositions of varnish, which are used for painting: as the seed-lac varnish; and also the following; which requires, however, previously, the preparation of the mastic varnish; that must be thus made.

“ Take five ounces of mastic in powder :
 “ and put it into a proper bottle with a pound
 “ of spirit of turpentine. Set them to boil
 “ in *balneo mariæ*, till the mastic be dissolv-
 “ ed ; and if there appear to be any foulness,
 “ strain off the solution through flannel.”

The mastic varnish being thus prepared, it may be converted into a proper varnish for painting by the following method.

“ Take then gum animi one ounce. Grind
 “ it on the stone with water, till it become
 “ an impalpable powder. Then dry it
 “ thoroughly: and grind it again with half
 “ an ounce of turpentine; and afterwards
 “ with the colours; moistening it with the
 “ mastic varnish till the mixture be of a due
 “ consistence for working with the pencil :

“ when it must be put into phials or tin vessels, as was before directed for the composition with shell-lac; and diluted, where there may be occasion, with spirit of turpentine.”

This is inferior in all respects to the shell-lac composition, except where touches of pure white, or very bright colours, are wanted: which suffer by the brownness of the shell-lac; and are preserved in this, that is nearly colourless: on which account, in the painting of flowers, or draperies, in miniature, the fine colours may be used with advantage this way, to heighten the lights; and the rest may be painted with the shell-lac varnish.

The method of painting in varnish being, however, more tedious than in oil, or water, it is now very usual in the Japan work, for the sake of dispatch, to lay the colours on with oil, diluted with oil of turpentine: taking care to have the mixture very thin; and to make the work rise from the surface as little as possible; and when the whole is perfectly dry, to lay over it several coats of thick seed-lac varnish; which will secure the colours extremely well, though not so as to render the whole equally hard and strong with the work done in shell-lac varnish.

The method of painting varnished work with oil may be greatly improved, by dissolving the white gums or resin in the oils, as was before advised p. 148, for common oil painting, in case of more delicate and valuable undertakings.

undertakings. Which composition being diluted with oil of turpentine, would work equally well with, dry much harder, and assimilate more with the texture of the varnish laid over or under the paintings, than the oils simply used: and it would likewise be attended with another advantage, which is, that the work would be sooner dry, and fit to receive the upper coats of varnish; which, in large manufactures, is an object of consequence.

The manner of preparing the seed-lac varnish, and using it, being the same for this as for other purposes, will be shewn in its proper place.

C H A P. V.

Of the nature and preparation of pastils or crayons.

PASTILS or crayons are compositions of colours, which are reduced to the texture of chalk; and used dry, in the form and manner of pencils, for painting on paper.

There is considerable difficulty, and nicety, in the making, to bring them to that due texture or consistence, which admits of their depending freely on the paper, without being so crumbly or brittle as not bear to have the point to be duly sharpened: for, if they be

rendered too cohesive by gums or such substances as give them tenacity, they will not cast as they ought; and, on the other hand, if the particles are not sufficiently bound together, they take no proper hold of the grain of the paper, but lye on it like dust; and the pencils in this condition are apt continually to have the points broken or moulder away on the least use, to an undue thickness. To produce this fit texture, so indispensibly requisite to the perfection of crayons, many substances have been used, to mix with the coloured pigments, and to give them the proper coherence: but, notwithstanding the repeated experiments that have been made by numbers of persons, for the improvement of this art, it is very rare to find a set of such crayons as may be called good. They are not, indeed, to be at all produced, but by an exercise of some judgment and skill in the composition of each particular; and there are few persons, who either have such, or will exercise their skill and knowledge in sufficient degree; and therefore recipes are blindly followed; which, as the different parcels of each kind of substance differ greatly in the proportion of their qualities, though they may agree in the general nature of them, sometimes produce good, and sometimes bad crayons, by the very same rules. Whoever, therefore, would be master of a perfect set of crayons, must inform himself of the several substances and their nature, which are proper for the composition of them; and

and then, having general directions for the manner, must proportion and adjust the quantity of the ingredients to each other, by actual trials of the effect; which may, nevertheless, be done with very little trouble; and without the danger of any loss accruing from the greatest error in the composition: since the crayons can always be wrought over again, with such additions of those ingredients in which the proportion is defective, as will remedy the fault. I shall, for these reasons, enumerate the several substances that are employed for forming crayons; and shew what particular intentions they are to answer, and the method of managing them to effect that end; and then give the particular mixtures, which I believe to be best for producing each kind of colour; with the nearest general proportion of the ingredients: but the adapting the quantities more exactly to each other, in every particular case, I must leave to the operator; who must try the result of his compositions, by drying a small quantity of each sort formed into a crayon, after he has made the mixture: which being tried on the proper paper, if it appear faulty, the proportion of the ingredients must be better adjusted, by adding more of that which appears to be deficient, till the due effect be produced.

All the colours, which are pigments, and can be reduced to an impalpable powder, may be used for forming crayons: but it is proper, nevertheless, to be cautious, especially in more

elaborate works and paintings of any value, with regard to such as are subject to fly or change; particularly rose pink, English pink, lake, and Prussian blue, which are apt to turn pale, and sometimes entirely lose their hue: and with respect to white, the use of flake white, or white lead is best avoided, on account of their frequently turning black; as there are others which will even work better, and are no way liable to any such change. But neither lake, nor Prussian blue, are to be wholly rejected for this purpose, when they are known to be thoroughly good; as they will stand extremely well when prepared in a right manner: only great care should be taken to be certain of the qualities of any parcel, before it be used; as the far greatest part of the lake to be now met with will fly; and the Prussian blue turn pale and green in such manner as to vary the tint greatly from its original state.

Besides the coloured pigments, which are used simply, some white substances are necessary for the forming a proper body to such as are of lighter tints: or where the colours are to be diluted and weakned, as in straw colours, pinks, carnations, &c. There have been many different sorts of bodies applied to this purpose, which, most of them, by proper management, may be made to answer the end. The principal are flake white, white lead, tobacco-pipe clay, p'aster of Paris, Spanish or troy white, simple chalk, and starch: but pearl white, that has been hitherto overlooked, is in some cases superio

superior to any of them. In this application of white bodies, to form the ground or basis of pale coloured crayons, the greatest care should be taken, likewise, when carmine lake, or any coloured pigment prepared from parts of vegetables or animals are used, that the substance employed be such as will not prey upon or change the colour; which chalk, flake white, and white lead, with the colours, are extremely apt to do, when they are mixt together with the addition of any moisture: but in all such cases the pearl white, and plaster of Paris, should be used; and with respect to the latter, it must be wholly free from lime, or it will be worse even than the others. It is best, indeed, in general to avoid any such mixture of these colours, by substituting the coloured earths, or other mineral substances, in the place of those prepared from vegetable or animal substances; as they can scarcely be affected or changed by any matter used in painting; and will, in general, equally well answer the purpose; except in the case of carmine; the unrivalled brightness of which makes it necessary for pinks, and carnations, as great purity and force of colour are there required.

Flake white and white lead are not so frequently used, as the chalk and tobacco-pipe clay for the grounds of crayons: neither indeed are they so fit for many purposes; as they will not mix well with many of the coloured pigments; and are liable to form too brittle pencils when cut to moderate points; and the
*white

white lead has besides, the dangerous quality of being subject to have its whiteness changed into the proper metallic colour of the lead: as we see in many of the older drawings and sketches where it has been used. The great whiteness of the flake, nevertheless, recommends it where touches of very great light are required: and it may not be amiss, therefore, to have a crayon of it for such occasions; but it is best to omit wholly its use in all cases, where the other whites will answer the purpose.

Tobacco-pipe clay was formerly in great use for forming the paler crayons: but it is much neglected now, except in those made for sale. For, besides its drying to be too hard, and not spending freely on the paper, it gives the colours a heaviness and deadness that may be avoided by the use of other whites: to some of which it is, therefore, on all accounts inferior. It may however serve for ordinary occasions: as it will produce crayons by being simply mixed with the coloured pigments: and therefore requires much less skill and trouble to be compounded with them than the softer whites, that demand the aid of some binder or glutinous body to give them a due cohesion.

Plaster of Paris has also been frequently used for the basis of pale crayons; to which purpose it is in one respect well adapted: because when it is pure, that is to say, made only of the powdered alabaster, it is very innocent with respect to the more tender colours: but there it is too cohesive, and wants the flakiness of
chalk;

chalk; which defect has been attempted to be remedied by the dipping the crayons formed of it in olive or linseed oil.

Spanish or troy white, which as we have seen before, is chalk and alum calcined and washed over, is used by some for a ground for the pale crayons. The difference in its effect from simple chalk washed over consists only in its being less liable to prey on the colours made from the parts of vegetables or animals: but, as the pearl white, or plaster, are much less hazardous in that point than either, the use of it seems no way necessary.

Chalk is the best adapted by its texture to the forming the ground of pale crayons of any of the whites hitherto used: as it will cast more freely; and at the same time retain a due cohesion, when mixt with proper binders or glutens, better than any of the other whites now in practice. It is, therefore, much the best substance for mixing with all the coloured pigments which are not subject to be changed; but with respect to such as are, the pearl white, or plaster of Paris, should be substituted in its place. It is also the best for forming white crayons for common purposes: which may be done by a very simple treatment as below directed.

Starch has been frequently used along with some of the other whites for giving a due texture to crayons: but it is no where necessary, except in the case of white flake: and, as the prepared flake white of the shops contains a
large

large proportion, it is unnecessary when that is used: which will generally be the case; as the levigation of the white flake is too troublesome for those who do not make such matters their business.

The last class of substances used in the composition of crayons, and on which indeed principally depends their perfection, is the binders or glutens required to give pulverine bodies, of which the crayons are composed, a due tenacity to render them capable of being formed into masses that will bear the form and employment of pencils. There has been a variety of different matters applied to this purpose; most of which may in some degree effect it; but the principal are alewort,—gum tragacanth,—gum Arabic,—size,—milk,—oatmeal,—sugar candy,—olive oil,—and linseed oil.

The wort of ale or beer, either in its original state, or rendered more thick by boiling, has been found to answer the end of a binder, for the forming crayons, where chalk or earthy bodies are used, better than any of the others. As it gives them a proper cohesion, by its viscosity, without drying to that brittle state to which the gums are subject. It is not, however, in the case of vermilion, and some other substances, which have no cohesive attraction of themselves, sufficient alone to give the due tenacity; and must therefore be assisted by gum tragacanth, or size, or some such other viscid matter.

Gum tragacanth is used as a binder by dissolving it in the ale wort, or whatever fluid is employed for the tempering crayons. It is preferable, for this purpose, to gum Arabic, or the other gums which dissolve in aqueous fluids : because it thickens in the water ; and mixes itself equally throughout the whole substance of the composition when dry ; whereas the others are apt to form a crust on the outside of the mass ; and render the pencils or crayons of an unequal texture.

Gum Arabic has been also used for tempering crayons in the same view as gum tragacanth : but for the reason just given is much inferior to it.

Size is also sometimes applied to the same purpose in making crayons as gum tragacanth ; and differs not greatly from it in its effect.

Milk has been used for the composition of crayons, in the same view as the ale wort, where only a small addition of cohesive power was required to be added to the solid bodies which formed them : but it is only in such cases, it can be of any avail ; as the ale wort, or others of greater efficacy, are in most cases wanted.

Oatmeal, or rather the decoction of it, made, as in the case of water gruel and strained, has likewise been employed for the same end as milk ; and answers well enough in the case of the deep Prussian blue, indico, and such bodies as are apt to dry gummy ; because though the decoction of oatmeal gives only a small degree

gree of cohesion; yet it prevents that coalescence from the attraction of the parts of those bodies on each other, which produces this brittleness.

Olive oil, as likewise the linseed, have been used to give the crayons a more flaky and chalky texture, by dipping into it, after they have been duly heated, such as are made of plaster of Paris, or tobacco-pipe clay, in order to soften them; and remove that unkindly cohesion which prevents the sticking freely on the paper.

I shall here give some general instructions, for the compounding crayons of the several colours and tints: but at the same time must leave it to the discretion of the operator, to adjust the exact proportion of the binders or glutens by actual trial; as the substances used vary too much in the degree of their qualities in different parcels, to admit of any standard proportion being given.

Of white crayons.

For forming white crayons for common purposes, chalk, in its natural state, is superior to any composition: it should be chosen white, pure, and of the most cohering texture: and it must be cut first into squares, by means of small saws, made for this use, of three inches length, and a quarter of an inch in thickness; and afterwards formed into a proper pencil

cil shape, by taking off the corners with a pen-knife, and duly sloping the point.

Where an extraordinary degree of whiteness is required, a crayon may be made from flake white, as prepared by the colourmen; which being well powdered and moistened with milk to the consistence of a paste, must be formed in the pencil shape, and then dried, but without heat; as that would tend to injure the whiteness by changing the colour of the flake in the same manner as in the production of masticot. If the crayon thus made appears to want tenacity, it must be worked over again with a fresh quantity of milk; or a little gum tragacanth may be added to the milk. This crayon, however, should not be used where chalk will be sufficiently bright: for all kinds of ceruse, as I observed before, are subject to have their colour changed by accidents not easily to be guarded against.

Of red crayons.

For red crayons of the scarlet hue, vermilion, and red lead, may be used, with ale-wort boiled, till it appear slightly glutinous to the touch, and further inspissated by the addition of gum tragacanth: the proportion of which may be a scruple to a pint of the thick wort. With this gluten, the vermilion, or red lead, must be reduced to the state of a paste, by grinding them together; and then
formed

formed into the proper shape ; and dried with a gentle heat.

Where the orange cast of red lead is not particularly wanted, it is safer to use vermillion ; for though red lead will stand much better used this way, than in oil, yet the vermillion is still more secure, as nothing can change it without a burning heat.

The paler crayons of the same colour may be made by mixing washed chalk with any of these colours : which may be done in three proportions, the first with an equal weight of the chalk, the second with double the weight, and the third with treble : but if other tints are wanting, the proportion may be varied otherwise according to the occasion. These compositions should be formed in the manner abovementioned, by means of ale-wort inspissated by boiling ; but the wort should be thicker where the quantity of the chalk is less, according to the three proportions : because after it has been moistened, and is again dried, chalk has a considerable cohesion of itself.

The scarlet oker gives a fouler red crayon, but yet very useful, if it be compounded with the ale-wort inspissated both by boiling, and the addition of gum tragacanth, in the proper manner directed for vermillion.

Scarlet oker may likewise be formed, by composition with chalk, into paler tints in the same way as vermillion.

Common

Common Indian red may be, likewise, treated in a parallel manner, and will give other teints of red.

Red oker requires no composition ; but if it be chosen pure, and of a good colour, will afford useful crayons by the same management as chalk.

Lake must be used for crimson crayons, and may be brought, when well ground with ale-wort, to a proper texture ; but if, as is the nature of some parcels, it appear too gummy, make it up with the decoction of oatmeal instead of the ale-wort. It is proper to be very careful in the choice of lake for crayons : for, as it is very apt to fly when not properly prepared, the consequence in crayon painting is in such cases very bad : since it will much sooner change when used in that manner, than in oil.

The paler teints of the lake must be produced by the admixture of several proportions of white ; in the same manner, as the foregoing colours. The white employed should not, nevertheless, be chalk, for the reasons before given ; but pearl white, or plaster of Paris. I think the former much the best : but in the compounding it into crayons with the lake, a stronger binder is required than in the case of chalk. The ale-wort should therefore be well inspissated by boiling for those crayons, where the proportion of lake is greatest : but, for the others, it should be adequately rendered yet more viscid by the addition of gum tragacanth.

It would be extremely proper to have crayons of carmine, if the price did not make the use of it too expensive. Considering that circumstance, it is more expedient to use it rubbed in by the leather roller in the manner below directed, by which it may be conveniently laid on where it may be necessary.

A small crayon compounded of the best and most scarlet lake, with about a third part of carmine, should, however, not be wanting. They may be worked up with milk, and a little decoction of oatmeal, with a small proportion of gum tragacanth; but some carmine is sufficiently glutinous, and requires no binder; which ought therefore to be first tried before the binders are added.

Small crayons must likewise be made of carmine, and pearl white, in different proportions; and the ale-wort must be more or less inspissated according to the quantity of white; but as the carmine differs greatly in different parcels as to its gummy consistence, this must be regulated by discretion.

Rose pink, when good, forms a crayon, which has merit with regard to its beauty; if its defect in other respects did not forbid the use of it. It may be made into crayons without any composition, in the same manner as chalk, where it is of so firm a texture as it is commonly found to be; but where it happens to be of a looser, it must be brought to a proper state of cohesion by ale-wort. It is, nevertheless, scarcely worth while to take the trouble of forming
an

any way into crayons ; as the colour will always fly, if the cold air have access to it ; and it can never therefore be prudently employed in paintings of any value.

Of blue crayons.

For a deep blue crayon, the darkest Prussian blue may be formed into a crayon by grinding it with the decoction of oatmeal. If the tenacity be not sufficient, the ale-wort must be added.

Indico, when good, will likewise produce a deep blue crayon, with ale-wort inspissated by boiling.

For paler blues, Prussian blue of different degrees of lightness may be used with ale-wort : but the ale-wort must be inspissated by boiling, or the addition of size or gum tragacanth, in proportion to the lightness ; the darker kinds of Prussian blue being of a more glutinous nature than the lighter.

Verditer will also make a good blue crayon : but it must be used with ale-wort strongly inspissated.

Bice should, likewise, compose another crayon, treated as verditer.

Crayons should likewise be formed of verditer, or bice, with chalk, in different proportions : and compounded by means of the ale-wort thickened by boiling.

Ultramarine, being too dear to form crayons, should be used in the manner above directed for carmine.

Of yellow crayons.

The prepared orpiment, or pigment, called King's yellow, forms the brightness and fullest coloured yellow crayon : but the poisonous quality, and yellow scent of it, are such faults as render it on the whole much inferior to that next mentioned.

The King's yellow may, however, be formed into a crayon with ale-wort inspissated by boiling, and the addition of gum tragacanth ; but it must be dried without any heat.

The turpeth mineral well levigated, and washed over, makes a very fine crayon, of a cool, but very bright yellow colour. It may be treated for this end exactly in the manner above directed for vermilion.

Dutch pink and English pink make crayons of a pretty good yellow colour ; but are not so secure from flying as the two abovementioned. When they are of a firm texture, they may be used as the chalk, without any other preparation than cutting them into a proper form : but where they are of a more soft and crumbly substance, they must be worked up with the inspissated ale-wort.

Yellow oker may also be formed into a crayon in the same manner as chalk ; or it may be ground and washed over ; and then used with the inspissated ale-wort.

More diluted tints of yellow may be procured by mixing chalk with any of the abovementioned pigments ; and forming them into crayons in the manner beforementioned for the other colours.

Of

Of green crayons.

The chrystals of verdigrise, properly managed, make the brightest green crayon. They should be reduced to a very fine powder, by grinding on the stone with spirit of wine, or oil of turpentine; and then formed into a palle by ale-wort highly boiled, and inspissated still further by gum tragacanth: but as little fluid as possible should be employed in their composition. They should likewise be dried without heat.

Verdigrise will make a light blue green crayon, if treated in the same manner.

Prussian blue, and turpeth mineral, compounded in different proportions, form also a variety of good green crayons. They must be worked up with ale-wort thickned by boiling.

Prussian blue and Dutch pink make likewise a pretty bright green crayon, being formed by means of the inspissated ale-wort.

Verditer, and turpeth mineral, form a good pale green: but they require ale-wort both thickned by boiling, and the addition of gum tragacanth.

Blue bice and turpeth mineral, or Dutch pink, make another kind of light green crayon, being treated in the same manner; except that when Dutch pink is employed, the ale-wort requires only to be well thickned by boiling.

Crayons may, likewise, be formed of any of the abovementioned green pigments, and chalk, by the means before directed with regard to the other colours.

Of orange crayons.

King's yellow, or turpeth mineral, with red lead, or vermilion, makes a bright orange crayon. They must be compounded with ale-wort thickned, as well by gum tragacanth, as boiling.

Orange crayons may, likewise, be formed from Dutch, or English pink, compounded with red lead, or vermilion: but the ale-wort need not, in this composition, be so strongly inspissated as for the last.

Chalk may be added to either of these, in different proportions, to vary the teints in the manner above directed for the rest: or good crayons of a paler orange, where brightness is not required, may be formed from Spanish annatto compounded with chalk; and worked up with ale-wort slightly inspissated.

The Spanish annatto used alone, being levigated with oil of turpentine, and formed by the addition of the decoction of oatmeal used in the most sparing manner, makes likewise a very good crayon of the full orange colour: but the preparation of this is more troublesome, than those given above; which will in general answer the same purpose.

Of purple crayons.

A very bright purple crayon may be formed of deep Prussian blue, and carmine, compounded by means of the decoction of oatmeal:

meal : but this being expensive must be made small ; and reserved only for those cases where great brightness is necessary.

Deep Prussian blue and lake, treated as the above, form a crayon next in brightness to the above.

For a less bright purple, indico may be used in the place of the Prussian blue ; but the tint will not be so deep ; and ale-wort slightly inspissated may be used instead of the decoction of oatmeal.

For coarser purples, indico may be compounded with vermilion : but they will be much paler than the above ; and for this composition the ale-wort must be well thickened by boiling, and a slight addition of gum tragacanth.

Of brown crayons.

For forming a full brown crayon, neither inclining to the olive nor orange, mix brown oker, and bistre ; and work them up with the ale-wort inspissated moderately by boiling.

Spanish brown, umbre, and the common, and true Indian red, may, likewise, be compounded in the same manner, with bistre, into crayons of different tints of brown : and ivory black may be added, where necessary, to darken them, and increase the variety.

Spanish brown and umbre, may be, likewise, formed alone into brown crayons, by means of the ale-wort inspissated by boiling, and a small addition of gum tragacanth.

For diluted browns, calcined fuller's earth may be employed, either alone, or mixt with chalk in different proportions. The crayons must be formed by means of ale-wort moderately inspissated by boiling.

Diluted browns may, likewise, be formed by adding chalk to any of the above compositions for browns.

Of black and grey crayons.

Black crayons may be formed out of pieces of charcoal well burnt, by cutting them into a proper shape, in the manner directed for chalk. The kind of charcoal, said to be the best for this purpose, is that made from the wood of the willow.

Good black crayons may, likewise, be formed of ivory black mixt with a little very deep Prussian blue or indico. It must be worked up by ale-wort boiled thick, with a small addition of glover's size.

Grey crayons may be formed of the ivory, or lamp black, mixt with chalk in different proportions, and compounded by means of ale-wort well inspissated by boiling.

The carmine, ultramarine, or any other colour which may be too dear, or not had in sufficient quantity to form crayons, may be used by means of the leather roll above mentioned. This roll is only a piece of shamoy leather formed into a kind of long cone by rolling it in a spiral manner, and then twining three ad

thread tightly round it to keep it from unfolding. The leather must be so managed in the rolling as to form a point of the degree of bluntness required; or if it be too blunt it may be sharpened with a pen-knife. With the point of this roll breathed upon, the carmine, &c. may be taken and laid on the painting in such touches as may be required, and the effect will be nearly the same as if the point of a crayon had been used. This roll will likewise be found useful in *sweetening* (as it is called) the colours, by rubbing the edges of the teints together, where the surface is not large enough to admit the finger to do that office.

C H A P. VI.

Of the grounds for the several kinds of painting.

SECT. I. *Of the grounds for oil painting.*

THE substance or matter on which oil paintings are made, unless in very particular cases, are canvas, wood, or copper-plate. The preparation or covering of these, in order to their receiving the proper colouring, must be therefore different according to the different substance in question.

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The pieces of canvas prepared by proper primings, are then by painters called *cloths*. But these cloths, though they are dispensed with in general, because painters think it too much trouble to prime them themselves, and therefore make shift with what the colourmen will afford them, who on their side likewise consult nothing but the cheapest and easiest methods of dispatching their work, are yet at present prepared in a faulty manner in several respects. In the first place, the whole covering is apt to peel and crack off from the cloth, by the improper texture of the under coat, which is formed of size and whiting; and is both too brittle, and too little adhesive, either to the cloth or upper coat, to answer well the purpose. In the second place, the oil used in the composition of any paint used on such grounds, is extremely apt to be absorbed or sucked in by them; and consequently to leave the colours, with which it was mixt, destitute in a great degree of what is necessary for their proper temperament. This is called, though improperly, *the sinking in of the colours*, and is attended with several inconveniencies; particularly, that the effect of the painting appears very imperfectly while the colours are in this state, and deprives the painter, as well as others, of the power of judging properly of the truth of the performance. It is indeed practised sometimes to varnish over the ground, which will prevent the sinking in; but there is a hazard in this, that the upper coat may leave the ground;

ground; and the painting consequently come off. Whoever therefore would have good cloths, free entirely from this disadvantage, must direct the preparation of them themselves; and they may produce them in perfection by the following means.

“ Let the cloths be first well soaked with drying oil laid on hot, and when nearly dry, let two or three coats of drying oil and red oker, mixed as thick as can be worked, be spread over it. Then, the last being dry, let the cloth be brushed over with hot drying oil, as long as it appears to sink in: and, lastly, let it be covered with a coat of white lead and oil, rendered grey, or of any other colour desired, by admixture of the proper pigments. This last coat may be polished to a due degree by rubbing with a pumice stone, or by glazing it with the glass polishers used for linnen, and called *callender stones*.”

In priming wood, or preparing it to receive the oil colours, the same errors are generally committed: for the method almost universally practised is to clear-coat it, (as it is called) with size and whiting; and then to cover it with white lead and oil: but the ill effects of such a method are still greater, in this case, than in that of canvas; as if any moisture find access to the wood, the paint rises in blisters, which are liable to be burst, and to cause a flaking off and peeling of the paint, in a very detrimental manner. For paintings of any value the wood should, therefore, be brushed
over

over with hot drying oil, as long as it will soak it in; and then covered with a coat of white lead, or flake, coloured according to what may be desired. Even in the case of house or coach painting, the clear-coating with size and whiting, ought to be omitted; and, in its place, a coat of drying oil with some white lead and oker, but not so much as to make it stiff, should be used as the first priming, instead of the size and whiting; which method would both preserve the wood much better, and prevent both the blistering and peeling; and in some degree the sinking in of the colours that attend the common method.

When copper-plates are used, there is no occasion for any other priming than one coat of oil, and lead, or oker, rendered of the colour desired: but such plates are seldom employed but for delicate and elaborate paintings. The surface of the priming ought to be made as smooth as the plate itself, by rubbing with the pumice stone, or glazing with the callender stone. But there is another method very effectual for making a fine ground on the copper-plates; which is the using flake white and fat oil, with any colour required; which being laid on the plates placed in an horizontal position to dry, will polish itself very highly, by the running of the oil. The oil used for this purpose should be thoroughly fat: which, though not at present to be had of colourmen, may be easily made by the method below taught, with very little expence
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and trouble; and this method of producing grounds by fat oil, perfectly smooth, secured from any sinking in of the colours, and in all other respects much better than any other, may be practised with advantage on cloths or wood, as well as copper-plates; the cloths being first prepared for the last coat in the manner before directed; and the wood soaked with drying oil.

SECTION II.

Of the grounds for water colours.

THE substance on which paintings with water colours are usually made, are cartoon, paper, (or a kind designed for this purpose), common paper, or vellum.

When paper of any proper kind is used, it is sufficient to prime it with isinglass, size thickened properly with pearl white, and any pigment which will afford the colour the ground is desired to be: but common paper may be rendered stronger and fitter to receive the colours, by laying on the back of it a coat of starch boiled with water to a moderate consistence, and rendered yet more tenacious by the addition of a little isinglass. This should be laid very smoothly with a brush; and the paper, when near dry, must be put betwixt the leaves of a book, or betwixt two sheets of paper and two boards, and compressed

ed by a weight laid on the books or boards. Two sheets of paper cemented together by the starch and isinglass, and treated in the same manner, make a very commodious substance for painting in miniature. It has been advised to pounce paper designed for painting with water colours, or to rub them over with alum water: but as the intention of this is only to guard against the defect of paper that will not take ink or other aqueous fluids without running, it is much better to avoid the use of all such paper; for the pounce prevents the colours working freely with the pencil; and the alum water changes several of the colours; as, for example, the litmus, and archal, if used, would be turned to a red from blue or purple.

Vellum has been, likewise, directed to be pounced by some of those, who have pretended to teach the best methods of managing water colours: but, if it be good, it requires no other preparation than the straining on a paste-board, or other such proper body, and priming it in the manner directed for paper: and if it should happen to be greasy, the rubbing it over with the gall of any beast will remedy the defect, without the inconvenience produced by the use of pounce. The straining the vellum on the paste-board, must be effected by cementing them together with the starch prepared as above, or with isinglass size, which is better for this purpose: and the vellum must be cut so much bigger than the paste-board, that it may lap
over

over on every side ; in the doing which care must be taken that it be equally stretched on each side, so as to render the whole perfectly even.

SECTION III.

Of the grounds for fresco painting.

THE substance or matter on which fresco paintings are generally made, is either plaster or canvas.

When plaster of Paris without lime is used, and the surface made smooth, there need no further preparation : but when any lime is used in the plaster, and any other colours are employed, except earths, or such as are prepared from mineral substances, the surface should be washed over several times with size and plaster of Paris free from lime, and suffered to dry then thoroughly before it be painted upon.

When canvas is used, as for scenes, &c. it must be coated with strong size and whiting till it be of a thickness to take a water polish, and then it should be primed with plaster of Paris free from lime, and mixed up with size as before directed for the plaster ; as it will then bear lake, carmine, or other colours prepared from vegetables without preying upon, or changing them. The manner of giving the water polish is by rubbing over the ground with a wet cloth till it be perfectly smooth.

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SECTION IV.

Of the grounds for varnish painting.

THE substance or matter on which varnish paintings are made is for the most part copper, iron, and wood. As the painting ground is not covered with the colours, in most works of this kind, it must consequently be of the varnish itself the work consists of; but where it is intended to be painted over, as in the case of regular pictures, a priming may be given of shell or seed-lac varnish mixed with the proper colours for the ground desired.

C H A P. VII.

Of the methods of varnishing, and preserving pictures and paintings.

THE method of preserving paintings in oil is by coating them with some transparent and hard substance, as a varnish, to secure the colours from the injuries of the air or moisture; and to defend the surface from scratches or any damages the painting might receive from slight violences.

The substances, that have been, or may be used for this purpose, are gum Arabic, glair or whites

whites of eggs, isinglass size, and varnishes formed of gum resins dissolved in spirit of wine, or oil of turpentine; which last, where oil of turpentine is used, are called oil varnishes.

Gum Arabic has been used, dissolved in water, as a varnish for pictures and paintings, on account of its being both more easily laid on, and taken off, than the varnishes formed of spirit of wine or oil of turpentine. It is more easily laid on, because it may be made exactly of that degree of viscosity with which it can be best worked with a brush or pencil; and because it is totally free from that accident called *chilling*, which attends all varnish made with spirit of wine. There is, however, along with these, another quality of so bad a kind, that its effects more than countervail these advantages in the use of gum Arabic, as a varnish for paintings; which is, that as it dries, it is extremely apt to crack; and give such appearance of flaws and scratches, as obscure and disform the painting to an intolerable degree; and, therefore, this gum is at present much rejected with respect to this application; and the substance we shall next consider substituted in its place. The addition of sugar or sugar-candy will greatly prevent the cracking of gum Arabic; but then it gives a viscosity or stickiness to the gum that makes the surface of the painting sully, and is in a manner equally detrimental with the cracking of the gum.

Glair of eggs, beat to an unctuous consistence, and spread with a proper brush over the paintings, answers much the same end as gum Arabic : but has the like advantages with much less of the bad quality of cracking : for which reason it is generally preferred to that gum. It has, nevertheless, one great defect, which is its not lasting, for it requires to be renewed frequently, as either moisture or great dryness of the air injure it. It is usual to mix a little brandy or spirit of wine with the glair of the eggs, in order to make it work more freely with a brush ; as also a lump of sugar to give it more body and prevent its cracking ; from which, after all, it will not be intirely free, after it has some time laid on, if the picture be put into a very dry place.

Isinglass size may be used for a varnish in the same manner as the solution of gum Arabic or the glair of eggs ; and if a little honey or sugar, about a fourth or fifth of the weight of the isinglass, be added to it, it will cover more effectually than either of them, and yet be free from cracking. This is not, however, so lasting a varnish as the gum resins, especially if the painting or picture be brought into a damp situation ; and indeed in all cases it is apt to turn very yellow with time : but where there is a prospect of having occasion to take off the varnish for altering the painting, this will be found a very good one ; as it may be intirely removed by means of a sponge and hot water.

There

There have been many compositions invented for spirit and oil varnishes for paintings; but the multiplying a number of ingredients in such compositions is by no means attended with advantages that are equivalent to the trouble. I will, however, give one of the applauded recipes of each kind; and then subjoin to it another more simple, which I believe will better answer the purpose.

“ Take of gum sandarac half a pound, of
 “ Venice turpentine one ounce and half, of the
 “ gums animi, and copal, each three quarters
 “ of an ounce, of mastic half an ounce, of Benjamin, gum elemi, and white resin, each two
 “ drams, of rectified spirit of wine one pound.
 “ Powder the Benjamin and gum animi; and
 “ put to them and the Venice turpentine, contained in a proper sized phial, eight ounces
 “ of the spirit of wine; to the copal and resin
 “ powdered, put, in like manner, in a phial,
 “ six ounces, and to the powdered gum elemi
 “ two ounces. Let them stand, shaking the
 “ phials frequently, till the gums, &c. be
 “ dissolved. Then strain all the solutions
 “ thro’ a piece of fine linnen into one bottle;
 “ and, after the mixture has stood some days,
 “ decant off as much as will separate clear;
 “ and keep it in a bottle well stop’d for use.”

Some omit the copal, which is in fact so much the same with the animi, that there is no certain mark of distinction known; and put in its place the same quantity of gum sarcocol: but it is not of any consequence,

which is admitted; nor whether three parts in four of the ingredients be rejected: for the following will answer the end equally well.

“ Take of the gums mastic and sandarac, powdered grossly, each six ounces, of Venice turpentine half an ounce, dissolve them in a quart of highly rectified spirit of wine, and strain off the solution as the above. If this be wanted harder an equal weight of the gums animi or copal may be added, and the quantity of spirit of wine doubled.”

In the using this kind of varnish great care must be taken that the picture receive no damage from it: for the dissolving power of the spirit of wine will sometimes reach the oil of the painting, and consequently disturb the colours.

The varnish should, therefore, be spread with as little and as gentle work of the pencil as possible; and care should be taken, likewise, that the painting be thoroughly dry before the operation be attempted. There is also another nice circumstance to be attended to in the use of this kind of varnish, which, is to avoid what is called *the chilling of it*; and will certainly happen, if the varnish be not laid on in a very warm place, or the picture itself warmed to a moderate degree: and this will be still more liable to happen, if the spirit of wine employed be not very highly rectified. If the varnish appear to be *chilled*, (that is when the parts of the gums do not attract each other; but precipitate from the phlegm, left by the spirit

spirit on its evaporating away, in the form of a powder, which gives a misty turbid appearance to the surface, instead of a transparent shining one,) another coat should be laid over it, which will in general remedy the mischief; and indeed less than two or three coats of this kind of varnish is not sufficient to preserve the painting, and bring out due effect of the colours; if they are in that state called *sunk in*, occasioned by the attraction of the cloth on the oils mixed with them.

The following is a recipe for an oil of turpentine varnish of the more compound kind.

“ Take of the gums mastic and sandarac,
“ each four ounces, of white resin two ounces,
“ of the gums sarcocol, animi, copal, and olibanum, each one ounce. Powder them
“ grossly; and put them into a phial with two
“ pounds of oil of turpentine; stop the phial,
“ but not too fast, lest it burst; and place it
“ in any heat; the greater the better, under
“ that which will make it boil. Let it stand
“ there, till the gums be dissolved, or at least
“ so much of them as will be dissolved, then
“ strain off the solution for use.”

The ingredients, except the mastic and sandarac, may be omitted at discretion: and with respect to the gums animi and copal, under which names, a variety of gums brought from the East and West-Indies, as well as Africa, pass, there are a very few parcels which will be found to dissolve in oil of turpentine. Indeed I have never found any that would be

so dissolved : but recipes like this have been given upon very good authority. The following, therefore, will be found a much cheaper, less troublesome, and equally good varnish with that made by this complex mixture.

“ Take of gum sandarac two ounces, of
 “ mastic and olibanum each an ounce and half;
 “ or three ounces of mastic, and Venice tur-
 “ pentine half an ounce : powder them ; and
 “ dissolve them in half a pound of oil of tur-
 “ pentine ; proceeding as in the above.”

When this kind of varnish is used, it is particularly necessary that the painting should be thoroughly dry ; and the pencil used as gently and sparingly in the laying it on as possible : for the oil of turpentine is extremely ready to dissolve the oil of the painting, if it be the least within its power : on which account the varnishes of this sort are much less used now than formerly. This varnish, however, will spread much more easily than that with spirit of wine ; and is not subject to chill, even though it be laid on without the aid of any warmth : but it is proper, nevertheless, to be very careful, that there be no damp or moisture on the surface of the painting ; which would prevent the varnish from taking hold ; and wholly frustrate the intention of it.

Varnishes have been used, likewise, formed of the gums sandarac, olibanum, and Arabic, with white resin and turpentine, dissolved in linseed oil ; but they are greatly out of use now, as such varnishes are slow in drying ; and the
 linseed

linseed oil will turn yellow ; besides the disadvantage arising from the impracticability of ever taking them off the painting again, whatever occasion there may be for it. But a very secure and good varnish may, nevertheless, be made, by dissolving two ounces of sandarac and olibanum, with half an ounce of Venice turpentine, in half a pound of old nut or poppy oil which is white ; and if too fat for other use, the better.

All these varnishes must be carefully laid on with a pencil or brush, according to the circumstances before intimated to be proper for each kind : but with respect to those made of spirit of wine or oil of turpentine, particular care must be taken not to pass the pencil or brush more than once over the same place : for, otherwise, it will produce streaks and inequalities which spoil the effect.

Paintings in miniature are preserved by means of plates of glass, or the talc called isinglass, placed in the frame before them. There is no particular method to be observed in doing this : but to make the frame so compact, that the air may have no access ; which, otherwise, will sometimes prey upon the colours.

Paintings in fresco, where they are of consequence enough to merit such care, may be rendered more durable, and preserved from foulness, by varnishing them with hot size boiled to a strong consistence, in which a fifteenth or twentieth part of honey has been dissolved.

Paintings in varnish require no means of preservation, but from violence; the varnish itself being a very sufficient defence of the colours against the air, moisture, or all other substances that might effect them.

Crayons must be preserved as paintings with water colours, by plates of glass or isinglass. There have been many experiments made to discover a method of varnishing and giving adhesion to the colours, to prevent their being so easily rubbed off, or indeed shaken off, with any very brisk motion: but the success has not been hitherto such as makes it material to communicate the particulars of them here.

C H A P. VIII.

Of mending and cleaning pictures and paintings.

S E C T. I. *Of mending pictures.*

WHERE pictures have been torn, parts of them destroyed, various methods have been used for repairing them; and making good the damaged or defective parts: but there is one simple method by means of the oil fattened together with the colours in what is called by painters the smush-pot, or vessel where they rub off the paint from the pencils, and put the scrapings of the pallet; which employed

employed in the following manner effectually answers the end, at least equally well with the most complex and elaborate method.

Where pictures are only cut, or torn, without any loss of their substance, they should be laid on a flat even board or table; and the torn or divided parts being carefully laid together with some of the matter of the smush-pot laid, as a cement, in and over the joint, they must be kept in that situation till this cement be thoroughly dry; the rising or inequality of the cementing matter with the surface, must then be taken off neatly by means of a penknife; and the part afterwards properly coloured to correspond with the picture.

Where the cloth is worn out in parts, or destroyed by any accidents, the defective places may be easily made good in the following manner. Having laid the picture on a flat board, cut out with a penknife, such jagged or damaged pieces, as cannot be brought to lie smooth and even. Then form a piece of canvas bigger than the whole intended to be covered; and plaster it over, with the above mentioned fat oil and colours taken from the smush-pot, on the outside of the cloth; and fit it properly as a patch to the place it is to make good; taking care that the margin, or that part which projects on every side of the hole have good hold of the canvas of the picture, and be pressed close every where to it. Then let it remain till it be thoroughly dry; and fill afterwards the inequality, or sinking of that part of the picture

picture where the patch lies, with the same matter from the smush-pot ; raising it somewhat higher than the surface of the picture to allow for the drying ; and if it rise too high, when dry, take it down with a penknife. After this is perfectly dry also, the part may be painted according to what the picture requires ; and it will be found to be equally sound and durable with any other part.

Where a picture is cut or torn into several pieces, the parts of it may be joined together and cemented down in the proper places, on a piece of fresh canvas, by the same means.

SECTION II.

Of cleaning pictures and paintings.

THE art of cleaning pictures and paintings is of great consequence to the preserving valuable works of that kind : but has been very little understood even by those who profess to practise it ; on which account many very valuable pictures have been damaged : and indeed few escape without damage, in a greater or less degree, which come under the hands of those who pretend to make it their business ; and yet most generally know no other than one single way of treating all the subjects they are to operate upon, however different

erent may be the condition or circumstances of them.

As a painting may be, however, fouled with a variety of different kinds of matter, many of which will not be dissolved, or suffer their texture to be destroyed by the same substances, it is necessary to know what will dissolve or corrode each such kind ; for there is no other means of removing, or taking off any fouls, than by dissolving or corroding by some proper menstruum the matter which constitutes ; except by actual violence ; which the tender nature of oil paintings by no means suffers them to bear. Of these substances, which will remove, by dissolving or corroding it, the matter which may foul paintings, some are very apt, likewise, to act upon and dissolve the oil in the painting itself ; and consequently to disorder or bring off the colours ; while others are, on the contrary, passive and innocent, with respect to the painting ; and may be used freely, or indeed in any quantity whatever, without the least inconvenience of this kind.

As paintings to be cleaned are likewise varnished with a variety of substances of different natures, which sometimes require to be taken off, and at other times are much better left remaining, it is very necessary to be able to judge what is best to be done in this point ; as likewise to know the means by which each sort of varnish may be taken off without injury to the painting : for in fact, without this, there is no way of cleaning pictures in some circumstances ;

stances ; but by scouring till, as well the surface of the picture, as the foulness, be cleared away. I shall therefore first give some account of the nature of the substances, which are, or may be used for cleaning paintings in oil, as it regards this application of them ; and then shew, how they may be used as well for the taking off the varnish ; as the removing any foulness, that may lie either upon or under it.

The first, and most general substance used for cleaning pictures, is water. This will remove many kinds of glutinous bodies, and foulness arising from them ; such as sugar, honey, glue, and many others, and also take off any varnish of gum Arabic, glair of eggs, and isinglass ; and is therefore the greatest instrument in this work. It may be used without any caution with regard to the colours ; as it will not, in the least, affect the oil which holds them together.

Olive oil, or butter, though not applied to this purpose, through an ignorance of their efficacy, will remove many of those spots or foulness which resist even sope ; as they will dissolve or corrode pitch, resin, and other bodies of a like kind, that otherwise require spirit of wine and oil of turpentine, which endanger the painting : and they may be used very freely, not having the least effect on the oil of the painting.

Wood-ashes, or what will better answer the purpose, when used in a proper proportion,
pearl-

pearl-ashes, being melted in water, make a proper dissolvent for most kinds of matter which foul paintings: but they must be used with great discretion, as they will touch or corrode the oil of the painting, if there be no varnish of the gum resins over it, so as to render the colours liable to be injured by very little rubbing. The use of them or sope, is, however, in many cases unavoidable, and in general they are the only substances employed for this purpose.

Sope is much of the same nature with the last mentioned substances; being indeed only oil incorporated with salts of the same kinds, rendered more powerfully dissolvent by means of quick-lime: for which reason it is something more efficacious; but consequently more hazardous; as it will the sooner get hold of the oil of the paintings. It should, therefore, not be used but on particular spots, that elude all other methods; and there with great caution.

Spirit of wine, as it will dissolve all the gums and gum resins, except gum Arabic, is very necessary for the taking off from pictures varnishes composed of such substances: but it corrodes also the oils of the paintings; and softens them in such manner, as makes all rubbing dangerous while they are under its influence.

Oil of turpentine will, likewise, dissolve some of the gums used for varnish: but spirit of wine will in general much better answer that purpose. There are, however, some-
times

times spots of foulness, which will give way to spirit of turpentine, that resist most other substances used in this intention: and it may, therefore, be tried where they appear to fail, but very sparingly, and with great caution; as it will very soon act even on the dry oil of the painting.

Essence of lemons has the same powers as oil of turpentine: but is, moreover, a much stronger dissolvent; and should, therefore, only be used in desperate cases, where spots seem indelible with regard to all other methods. Spirit of lavender and rose-mary, and other essential oils, have the same dissolving qualities as essence of lemons; but they are in general dearer; and some of them too powerful to be trusted near the colours.

Whenever paintings are varnished with gum Arabic, glair of eggs, or isinglass, the varnish should be taken off when they are to be cleaned. This may be easily distinguished by wetting any part of the painting, which will feel clammy, if varnished with any substance dissolvable in water. In such cases, the taking off the varnish will frequently alone render the painting intirely clean: for if it have been laid on thick, and covered the surface every where, the foulness must necessarily lye upon it. The manner of taking off this kind of varnish must be done by means of hot water and a sponge; the picture or painting being laid horizontally. The water may be near boiling hot; and may be used copiously at first with

with the sponge: but when the varnish appears to be softened, and the painting more naked, it should be used cooler; and, if the varnish adhere, so as not to be easily brought off by a sponge, a gentle rubbing with a linnen cloth may be used; the cloth being frequently wrung, and wet again with fresh water a little warmish.

Where paintings appear by the above trial to be varnished with the gum-resins, or such substances as cannot be dissolved in water, it is proper, nevertheless, to wash them well with water pretty warm, by means of a sponge; which will sometimes be alone sufficient to clean them, even in this case: but if there yet appear any foulness, rub the painting over with olive oil made warm, or butter; and if any parts appear smeary, or any foulness seems to mix with the oil or butter, pursue the rubbing gently; taking off the foul oil, and adding fresh till all such foulness be wholly removed. Let the oil be then wiped off with a woollen cloth, and if the picture require further cleaning, the wood-ashes, or pearl-ashes, must be used in the following manner; which, indeed, as to the first part is not widely different from the method commonly used.

“ Take an ounce of pearl-ashes, and dissolve them in a pint of water: or take two pounds of wood-ashes, and add to them three quarts of water, and stir them well in the water once or twice in an hour for half a day; and then, when the earthy part of the ashes has subsided, pour off the clear fluid

“ fluid, and evaporate it to a quart; or if it
“ appear acrid to the taste at that time, three
“ pints may be left. Wash by means of
“ sponge the painting well with either of
“ these solutions, or lyes (which are in fact
“ the same thing) made warm; and rub any
“ particular spots of foulness gently with a
“ linnen cloth till they disappear: but if they
“ appear to remain unchanged by the lye, do
“ not endeavour to take them off by meer
“ force of rubbing; for that would infallibly
“ damage the colours under the spots before
“ they could be removed: but in this case
“ they should be left to be tried by the spirit
“ of wine, or the essential oils of turpentine
“ and lemons. Where thick spots seem to
“ give way in part, but yet resist in a great
“ degree to this lye, a little strong soap-suds
“ may, in some cases, be used, if with great
“ caution: but it should be prevented as
“ much as possible, from touching any part
“ of the painting, except the spot itself: and,
“ as that disappears, the soap should be di-
“ luted with water, that it may not reach the
“ oil of the colours in its full strength. If,
“ however, all this be done upon a strong
“ coat of varnish, there will be less hazard;
“ and, in such cases, the washing freely with
“ the wood-ash lye, or weak soap-suds, will
“ frequently do the business effectually with-
“ out any material damage: but it requires
“ some judgment to know where paintings
“ may be so freely treated; and, with respect
“ to

to those of great value, it is always best to proceed by more circumſpect methods; and to try the more ſecure means I have above directed, before theſe rougher be ſed."

Some uſe the wood aſhes with the addition of water only, without ſeparating the ſolution of the ſalts from the earth; which, when ſo uſed, aſſiſts in ſcrubbing the foulneſs from the painting: but all ſuch practices are to be condemned; as the finer touches of the painting are always damaged in a greater or leſs degree, where any abrading force is employed in cleaning it.

Where ſpots appear, after the uſe of all the above mentioned methods, ſpirit of wine, if that fail, oil of turpentine, and in the worſt caſe of its default, eſſence of lemons, may be applied. The ſpots ſhould be lightly ſtened with them; avoiding to ſuffer them to ſtain any more of the ſurface than what is covered with the foulneſs; and the part ſhould immediately rubbed with a linnen cloth, very gently; obſerving at the ſame time to reſiſt, if the colours appear the leaſt affected.

After a little rubbing olive oil ſhould be put on the ſpot, where oil of turpentine or eſſence of lemons are uſed; and water where ſpirit of wine is applied; which being wiped off by a woollen cloth, if the foulneſs is not wholly removed, but appears to give ground, the operation muſt be repeated till it be entirely obliterated.

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Where paintings appear to have been varnished with those substances that will not dissolve in water, and after the careful use of the above means the foulness still continues, or where, as is very often found, the turbidness, or want of transparency or the yellow colour of the varnish, deprave the painting so as to destroy its value, such varnish must be taken off. The doing of which, though attended with the greatest difficulty to those who proceed by the methods now in use, and which indeed is seldom done by them at all, but with the destruction of the more delicate teints and touches of the painting, is yet very easily and safely practicable by the following method.

“ Place the picture or painting in an horizontal situation ; and moisten, or rather flood, by means of a sponge, the surface with very strong rectified spirit of wine ; but all rubbing more than is necessary to spread the spirit over the whole surface must be avoided. Keep the painting thus moistened, by adding fresh quantities of the spirit for some minutes : then flood the whole surface copiously with cold water ; with which, likewise, the spirit, and such part of the varnish as it has dissolved, may be washed off. But in this state of it, all rubbing, and the slightest violence on the surface of the painting, would be very detrimental. When the painting is dry, this operation must be repeated at discretion, till the whole of the varnish be taken off.”

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In pictures and paintings, which have been long varnished, it will be found sometimes, that the varnish has been a composition of linseed oil, or some other substantial oil, with gums and resins. If such paintings cannot be brought to a tolerable state, by any of the above mentioned means, which may in this case be freely used, the mischief may be deemed to be without remedy. For it is absolutely impracticable to take off such a varnish, as it is more compact and indissoluble than the oil of the painting itself; and could only be wrought upon by those menstrua and dissolvents, which would act more forcibly on the paintings: such pictures must, therefore, be left in the state they are found; except by being freed from any foulness that may lye upon this varnish; and may be cleared away by the methods we have before directed. The coat of this varnish may, indeed, be sometimes made thinner by anointing the surface of the painting with essence of lemons; and then putting on olive oil, which, when rubbed off, by a soft woollen cloth, will carry away the essence with such part of the varnish as it may have dissolved: but this requires great nicety; and can never be practised without some hazard of disordering the colours of the painting.

C H A P. IX.

Of the nature, preparation, and use
of the several substances employed
in enamel painting.

SECT. I. *Of the general nature
of enamel painting.*

ENAMEL painting differs from all
other kinds, in employing, as a vehicle
for the colours, (to hold the parts together,
and bind them to the ground they are laid
upon) glass or some vitreous body; which be-
ing mixt with the colours, and fused or melted
by means of heat, becomes fluid; and
having incorporated with the colours in that
state, forms together with them a hard mass
when grown cold; and answers, therefore,
the same end in this, as oil, gum-water, size,
or varnish, in the other kinds of painting.

The glass or vitreous body, applied to this
purpose of mixing with the colours, in order
to bind them to the grounds, is called a *flux*;
and makes one principal class of the substances
used in enamel painting. When this flux is
easily fusible, that is to say, melts with a less
degree of heat, it is, in the style of those who
work in enamel, said to be *SOFT*, as
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when it is reluctant to melt, and requires a greater degree of heat, it is called *HARD*; and these terms are as well applied to the matter of the enamel grounds, and all other vitreous substances concerned, as to the fluxes. It is, in general, a perfection of the flux to be soft, or run easily into fusion: but the great point, with respect to this particular, is, that when several mixtures of colours and fluxes are used at the same time, they should all correspond to each other in the degree of this quality: otherwise some would be rendered too fluid, and perhaps run the matter of the enamel ground into fusion, and mix with it, while others remained solid and insufficiently fused themselves. It is always necessary, likewise, that the enamel of the ground should be considerably harder than the mixtures for the colours: for if they both melt with the same degree of heat, they will necessarily run together.

It being requisite that the body painted in enamel should undergo a heat sufficient to melt *soft* glass, the matter of such body can only be gold, silver, copper, porcelain, or China-ware, *hard* glass, and earthen-ware: and where the metals are used, if the painting be of the nature of a picture, or demand a variety of colours, it is necessary that a ground of white, or some other colour, should be laid on the metal; the body of which ground must necessarily be of the same vitreous nature as the flux, but harder; as nothing else

can endure so great a heat that is capable of incorporating with, and binding the matter of the white, or other colour, to the surface of the metal. The grounds, therefore, make another principal class of the substances used in enamel painting.

The third class is the colours, which must likewise be bodies capable of suffering the heat of melted glass: and such as will either themselves be converted into glass, or kindly incorporate with it in a melted state. This of course confines the matter of such colours to metals, earths, or other mineral bodies; all vegetable and animal substances being calcined and analyzed, with a greatly less degree of heat than the lowest sufficient to work enamel.

The fourth kind of substance is what I shall call *the secondary vehicle*; which is, some fluid body for laying on the ground, and working with the pencil, the flux and colours when mixt together; since, as they form only a dry powder, they could not be used as paint without some such medium. But as this is to serve only for spreading and laying on the matter of the enamel, and not, like other vehicles, to assist in holding the colours together, and binding them to the ground (that being in this kind of painting the office of the flux) it is necessary, that it should be some such substance as will evaporate and dry away without leaving any part behind: which would otherwise be heterogeneous matter with regard to the enamel; and consequently injurious to it.

Essential

Essential oils have been, therefore, used for this purpose, as they have this quality of wholly drying away on the first approach of heat, together with a slight unctuousity, which renders them capable of making the matter of the enamel work properly with the pencil.

The preparation of these several substances, have been till of late greatly monopolized by the Venetians, except what were prepared at Dresden since the establishment of the China manufactures; or known but to few others, who practised the preparing only some kinds: and even at present, there are, perhaps, none in this country, who prepare more than a small part of the variety necessary. For tho' many possess the knowledge of some particular articles, yet they are ignorant with regard to others, which are again, perhaps, known to those who are ignorant of these; there having been hitherto no means afforded to the practicers of it of learning the particulars of this art in a system: and a deeper knowledge of the principles and practice of chemistry is requisite to the attaining it, without being taught, than could well fall to the share of painters, or other artists. I shall, therefore, be more minute in my instructions for the making the several kinds of the grounds, fluxes, and colours; in order that they who are concerned in, or may be desirous to apply themselves to the art of painting in enamel, which is now become the basis of a considerable manufacture in this

country, may furnish themselves with whatever is necessary in its greatest perfection.

Besides the knowledge of the preparation of the above substances, and of that part of the art of using them, which belongs to painting in general, there is another requisite, which is that of the *burning*, as it is called, the grounds, in order to forming them on the body to be painted or enameled; as also the colours with the fluxes after they are laid on the grounds. What is meant by *BURNING*, is the giving such a heat to the matter, when laid on the body to be painted, as will fuse or melt it; and consequently give to the flux or vitreous part of the composition the proper qualities of a vehicle for binding the colours to the ground, and holding the parts together. As this requires a particular apparatus, I shall endeavour to shew the method of constructing it in the most expedite and easy manner; and to give such cautions for the conduct of the operation, both for burning the grounds and painting, as may best enable those, who are less experienced in it, to attain to perfection in this art. It cannot be expected, nevertheless, considering the nicety of the subject, such directions can be given, as will insure success in the first trials, with regard to several of the processes; or even the general operations: but whoever will make themselves masters of the principles on which they depend, which are all along intimated, will easily be able to correct their own errors.

A judgment formed by some little experience, is likewise requisite for the preparing well the colours with certainty. For as different parcels of the same substance vary frequently in their qualities, with regard to the degree or proportion, it is necessary to make allowance accordingly in the proportion of the quantities in the mixtures; which cannot be done till some little previous trial be made; and the power of judging of them be gained by an experimental acquaintance with them. But as the materials in general are very cheap, and the experiments may be made in the same fire where actual business is done, whoever would excel in the art of preparing and using enamels, should take a considerable scope of experimental inquiry into the effect of all the various proportions and commixtures of the substances used.

SECTION II.

Of the apparatus, or set of utensils for the preparing and laying on the grounds and colours in enamel painting.

THE apparatus necessary for preparing and using the several substances employed in enamel painting, consists of a furnace

nace for calcining and fusing the matter of which the colour is composed ; as also for burning or fusing the grounds and colours after they are laid on ;—of proper muffles or coffins for securing the enameled paintings from the injury of the fire while they are burning ;—of pots for fusing the compositions for colours and fluxes, or the mixtures of them together ;—of crucibles for calcining copper and other metals, in order to the preparing the colours ;—of mortars of glass, agate, or flint, and of stones and mullars of porphyry or flint, for the pounding and levigating the several kinds of matter ;—of tongs for taking the pots, muffles, &c. out of the fire ;—of brushes, pencils, a fine searce or sieve.

The furnaces for burning enamel are constructed of very various size or figure, according to the nature and qualities of the work ; and some are made to be heated with common coal, and others with charcoal, but at present not frequently. The best form for a furnace for enameling pictures, or other pieces of the same magnitude, where the dispatch of great numbers are not wanted, is the following ; which is made to work with a fixt muffle ; in or out of which, the work may be taken without opening the door of the furnace, and annoying the operator with the heat ; who, for the same reason, likewise may conveniently inspect the work in the muffle.

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The iron-work must be first prepared: which consists of a frame and bars, such as is described in p. 15; the area of which together must be ten inches by seven;—of a door and frame, such also as is described in p. 16, which must be five inches high and seven long;—and of a plate or strong bar to lay over the opening of the front, as below directed, which must be ten inches long; with another of the same magnitude to lay over the door and frame; and one of eight inches to lay over the vent into the chimney;—of a frame for bearing the fixt muffle, which must suit the figure of the muffle; except, that it must be only three inches in depth, with the back part open, for the muffle to pass through it into the cavity of the furnace; and that the plate which forms the bottom must project an inch and a half of each side, beyond the arch or covering, for the brick-work to have good hold of it; but this will be better understood by considering the form of this kind of muffle, as below described.

The iron-work being prepared, let a chimney of twelve or fourteen feet height be raised; the cavity of which must be an area of seven or eight inches square, in the front wall of which chimney a hole must be left for admitting the smoke of the furnace. The hole must be so placed, that the lower part may be five feet above the foundation of the chimney; and it may be four inches high and six long: the plate prepared for this purpose being

ing laid over to support the brick-work above it.

The chimney being raised to a proper height, let a pedestal or foundation to the furnace be built, by adding two walls to those of the chimney, so as to inclose an area, fifteen inches in depth from the front, and eight inches wide : the front being left open from the default of a fourth wall. This pedestal must be raised four feet and a half high ; and then the frame and bars for supporting the fewel, with their cross-bars, must be laid ; the furthestmost cross-bar being laid close to the back of the hollow area ; or, in other words, to the wall of the chimney. The plate or flat bar must be also laid close to the outermost cross-bar of those for bearing the fewel, in order that the brickwork may be carried over the hollow area, and inclose the square cavity of the furnace intirely. The brickwork must be then raised six inches higher, in the same manner as before ; only the front must now be carried up, as well as the sides ; which, together with the wall of the chimney, forms a complete inclosed area for holding the fewel : but particular care must be taken in laying the first course of this brickwork, that the flat ends of the cross-bars, in which those designed to bear the fewel are fastened, be well secured by the bricks which lie over them. When the cavity for holding the fewel is thus formed, the door and frame must be placed in their proper situation, and the brickwork must be carried up on the two sides

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to the level of the top of the frame.: but in the side most conveniently situated, the iron frame for bearing the muffle must be fixed in the raising this part of the brickwork. This frame must be placed about four inches higher than the bottom of the door, and two inches from the back or furthestmost part of the furnace; care being taken, that the brickwork have good hold of the parts of the frame formed for that purpose. The bricks contiguous to the frame should be properly sloped to the hole formed by it, that the opening into the muffle may be wider and more commodious for the taking out and putting in the work to be burnt; as also for the more easy inspection of it while burning. The brickwork being brought to a level with the top of the frame of the door, the plate or flat iron bar provided for that purpose must be laid over it, in order to support the building over it: and the sides of the furnace must be raised five inches higher, and the cavity or hollow then covered with a dome of fire-stone, made a little concave on the inner or under side, and of any figure the stone will best admit on the outward or upper. This dome must rest on the brickwork; and they should be so fitted to each other as to make as close a joint as possible; so that a coat of fire-lute being laid on the bricks when the dome is put on, the furnace may be perfectly tight. Windfor bricks should be employed for all that of the furnace which is above the bars for bearing the
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the fewel, and they should be laid in Windfor loom.

Where greater quantities of pieces are to be enamelled, and dispatch is required, furnaces must be built in the manner proper for containing coffins instead of a muffle: for the constructing which the following is a very good method.

This furnace must be built till the fabric rise within two inches of the top of the door, in the same manner as the former; except with regard to the dimensions; and the adding a back wall against that of the chimney, which must be eight inches in breadth, and twenty inches in length. The dimensions of the cavity of the chimney, till it rise to the height of five feet ten inches, must be twelve inches in breadth; and seven or eight inches in depth, from the front: and the hollow or area under the bars for bearing the fewel must be eleven inches and a half deep from the backwall to the front, and twelve inches wide; and that of the furnace where the fewel is to lie eight inches in depth from the front wall to the back wall, and twelve inches in breadth; to which dimensions the bars and corse-bars must be suited. The building being carried up to the height here mentioned, a door and frame of the same form with that for feeding the fire must be fixt in the most convenient side of the furnace: the intention of which door is to serve for putting in and taking out the coffins: and it must there-
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fore be placed so that one end of the frame may be close to the chimney. The dimensions of this door must be ten inches in height, and eight in breadth. Then the brickwork of the chimney may be proceeded with in the same manner as before ; except that the back wall against the chimney must be raised no higher ; but the space it would take, if carried up higher, must be added to the cavity or hollow area of the furnace ; the top of this wall serving as a support to the coffins, which are to be placed upon it ; only two pieces of fire-stone of ten inches length, and of the thickness of two inches square, must be put with their lower part fixed, at about three inches distance in the brickwork from the wall of the furnace, that the coffins resting upon them, the flame and heat of the fire may pass under as well as over them, and heat every part equally. Two vents into the chimney must be, likewise, made close to each side wall of the furnace ; and may be placed at the height of two inches above the level of the top of this wall, and of the dimensions of four inches in breadth, and three in height. When these several parts have been compleated, and the whole fabric is raised fifteen inches above the level of this wall, a dome of fire-stone must be fitted to it, in the same manner as was directed for the former furnace ; only it is necessary, in this case, that though the inner or under side be concave, the upper should be flat, for the coffins to stand upon it to heat,

before

before they be put into the furnace, to prevent their cracking from too sudden an effect of the fire.

It is sometimes practised to burn enamel on a hearth with charcoal; in order to which no apparatus is necessary but a proper hearth of fire-stone or bricks, and a skreen of brick, or some such other material, through which to pass the nozzle of the bellows to blow the fire without burning them.

The bellows for this purpose must be made in the manner of those used for chemical experiments, to work with a weight, and to be moved by the operator as he stands by the fire; but a very small pair of that kind will serve for this purpose.

Melting pots for fusing the fluxes or colours are indispensibly necessary; the common crucibles being of too loose a texture to contain vitreous bodies, when perfectly liquified. These melting pots are not to be purchased, but must be made for the express purpose. The proper materials are tobacco-pipe clay or Sturbridge clay (which is much cheaper here) two parts, and crucibles ground to powder (or in default of them fine sand) one part; which must be tempered with water, and well mixed together. The dimensions must be regulated by the quantity of matter to be fused; and the shape may be a little conical, rather deep than shallow; to form which a solid mold of wood should be procured for working them upon to bring them to a regular figure. When they
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are formed, they must be first well dried, and then thoroughly baked, before they be used.

Muffles and, where the quantity is great, coffins formed of the same matter, are requisite for the burning, as well the grounds as paintings in enamel. The use of muffles is to preserve the enamel from being injured by the falling of the coals upon it, or by the smoke and fumes of the coal, which in many cases is very detrimental to the colours. The matter of which the muffles may be fabricated may be the same with that just now given for the melting pots; and they must be also dried and well baked before they be used. The form of the muffles may be of two kinds; the one that comonly used: the other a close muffle fixt in the fire, which is a much more commodious method than the having them loose.

The shape of the common muffle is only a flat square piece bent into the form of an arch, of such dimensions, that being laid over the enamel work to be burnt, it will cover it. These may be best made by spreading the matter properly tempered on a piece of wood, turned to make a round correspondent to the arch of the muffle, and working it even on the outside by a knife or other flat instrument; and it may be left on this mold or round piece of wood till it be moderately dry and firm. It is proper also to make a bottom to this kind of muffle, on which the plate may be laid: but this may be either a detached part, or joined to it. It is only a flat piece formed of the same

substance, and of such magnitude as to suffer the muffle to rest upon it every where, and, if loose, to have a margin of half an inch for the better taking it out of the fire : but if fixt to the muffle, it need only be of the same extent with it.

The fixt muffle must be of the same general figure with the loose kind ; but the bottom must be always a proper part of it, and exactly of the size suitable to the extent of the arched part, without any margin.

The size of this kind of muffles must be adapted to the sort of enamel work to be burnt in them : the breadth should be such as will suffer the pieces to be easily put in and taken out ; and the height of the arch, where the form of the pieces does not acquire it to be higher, should not be above two inches. The end of this arch within the fire must be closed up, so that when the muffle is passed through the iron frame in the side of the furnace made to support it, and the joint made good by fire-lute, the hollow or cavity of it may be intirely inclosed, except the mouth or opening on the outside of the furnace. The length of this kind of muffle should be sufficient to admit its passing five or six inches into the fire ; and yet having a proper proportion remaining to project on the outside somewhat beyond the iron frame. But these proportions are to be adjusted by the room wanted. There must be a false bottom likewise made to this kind of muffle, which must

must fit the other bottom, so as to slide in and out of the muffle upon it; but it should be made of such length, that when it is thrust home into the muffle, a part of it may project; that proper hold may be always taken for drawing it out. The design of this false bottom is, that the enamel work to be burnt, being laid upon it, may be put into the muffle and taken out without that difficulty and hazard of injury, which would otherwise result from the form of the muffle.

Coffins for burning larger quantities of enamel work may be made of the same matter with the above. The figure of them may be that of square boxes of the length, when intended for a furnace of the dimensions above given, of ten inches; of the breadth of six; and of the height of seven; which measures should include also the thickness of the substance of which they are formed. In the cavity of these boxes, little columns, or projecting parts, should be placed against the sides, rising to half the height of the cavity: in order that a square plate or piece of the form and size of the area may be laid on them hollow, as a flooring to support a second range or layer of the enamel work: and a lid must be likewise fitted to rest in a proper groove made in the sides of the boxes or coffins, at the top of them, that the fire and smoke may be wholly excluded from the cavity.

Crucibles of proper sizes must likewise be had for calcining the metals; but as they are

to be obtained every where easily, it is needless to say more of them.

Mortars for levigation must be likewise had of various sizes; they should be either of agate, flint, or glass; for those of iron, or copper, would be liable to deprave greatly many of the colours; and to these should be added, a porphyry stone and muller; marble being too soft to bear the attrition of many of the substances used in enamel, without imparting too much of its own substance in consequence of such abrasion.

Searces or sieves of fine lawn must be also provided, for sifting some of the levigated substances, as also for spreading the powdered enamel to form the grounds: they should be like those of the apothecaries and druggists, with a cover and under part for preventing the waste of the matter, which attends the sifting in the open air.

Tongs with points bended at right angles must also be procured, for taking out of the fire the crucibles and melting pots; an iron instrument like a baker's peel is likewise necessary, where the coffins are used: the flat part must be something broader than the coffins, and of nearly the same length; and the handle should be about three feet in length.

To these must be added brushes, pencils, tiles, and other common implements of painting: but as they are to be had every where, and their structure is generally understood, it is not necessary to be more particular about them.

SECTION III.

Of the general nature and application of the substances used in enamel painting; with their previous preparation.

Of the substances used for forming fluxes.

MINIUM or red lead is used, as a fluxing body, for forming the enamel for grounds; as also in compounding fluxes for the colours. It requires no preparation for these purposes; only it is proper, it should be pure; which may be known by the method before given p. 48. This flux renders the enamel soft; but producing some proportion of yellow colour is not fit for all uses.

Fixt alkaline salt of vegetables is sometimes used also in forming the mixture for enamel grounds; as likewise in some compositions of fluxes for the colours. It makes a less soft enamel than the lead; but is free from yellow, or any other colour; and therefore proper for some purposes.

Borax is a salt of very peculiar qualities; amongst which, is that of promoting vitrification, and the fusion of any glass when vitrified, in a greater degree than any other substance known; on which account it is of the greatest consequence, in forming fluxes for enamel. It requires nevertheless either to be previously calcined or brought to a vitreous state, which it suffers from the application of moderate heat a-

lone ; and then finely powdered before it be mixed with other ingredients in fluxes. Its use is not much known in common practice ; though of the greatest consequence to the art of enameling ; as not only a set of softer colours may be produced by the aid of it, than can be otherwise had ; but the degree of each may be brought to correspond, by the employing it in different proportions according to the respective hardness of the other ingredients, which differs so much, as not to be regulated justly by any other means.

Common salt may be also used as a flux in enameling, particularly where there is occasion for glazings : where, as it is extremely fluid, and free of tenacity when fused, as also less subject to crack than any other vitreous body, it is of great use. But for fluxes for grounds and colours in enamel it is not frequently necessary to multiply ingredients, as the above three substances may, when properly applied, sufficiently answer most purposes : and the same reasoning extends to nitre and arsenic ; which though they have the qualities of fluxes, possess yet along with them such other, with respect to their effect on several of the substances that compose the colours, as renders the methods of using them difficult and complex.

Of the substances used for forming the body of enamel, or fluxes.

White sand is used as a body for the fluxes : and grounds of enamel : it should be reduced
pre—

previously to an impalpable powder, in order that it may be mixed more intimately with the other ingredients ; which not only accelerates the vitrification ; but renders the glass greatly more perfect. The kind of sand proper for this purpose is that brought from Lynn in Norfolk ; and called by the name of that place.

Flints are used for the same purpose as the white sand : and it is proper to use them, when that cannot be procured of the right kind. They require to be calcined before they are applied to any purpose of vitrification : which is to be done, by putting them into any fire, and continuing them there till the whole substance become white : when they must be taken out ; and, while of their full heat, immersed in cold water ; and kept there for some time : by which treatment, they will be rendered of a very brittle and calcarious texture ; and very easy to be powdered : which must be done to a perfect degree for the reason above given. Where small quantities of the matter of any kind of enamel is to be prepared, calcined flints are preferable to sand ; as they are much more easily reduced to an impalpable powder, and the trouble of the previous calcination is very little.

There is a sort of stone which the French call *moilon*, that forms the upper crust, and lies round the free stone in most quarries. This stone will lose its tenacity in a moderate fire, and when calcined, runs much sooner into vitrification than either flints or sand. It is there-

fore, when it can be obtained, a better matter for the body of fluxes or soft enamel than either of the other : as it will, with the same proportion of the fluxing ingredients, make a much softer flux ; or it otherwise, admits of the diminution of the proportion of some of them ; which, for reasons we shall see below, is in certain cases an advantage.

Of the substances used for producing a white colour in enamel ; or for forming the grounds.

Putty or calcined tin is used as a body of colour for the enamel grounds. As tin is very troublesome in calcining, requiring a long continuance of fire, and to be spread into a very large surface, it is much the best way to procure it for the purposes of enameling ready calcined, of those who make it their proper business to calcine it, for the use of lapidaries, and other artists who use it ; as they have large furnaces, fitly constructed for performing that operation in large quantities, and can consequently afford it much cheaper than it can be prepared in small quantities ; besides the sparing the trouble. It must be demanded of them by the name of putty ; and care must be taken that it be not sophisticated : which it seldom fails to be before it comes out of their hands for common purposes. The sophistication, which is generally by chalk, lime, or some such white earth, may be distinguished by putting the putty into a crucible with some
1
tallow

tallow or other greafe; and giving it the heat of fusion, or what is sufficient to melt it; supplying the greafe in fresh quantities as it burns away, till the calcined tin appear to have regained its metallic state: when suffering the remainder of the greafe to burn away, the chalk or earth, if any were mixt with it, will be found swimming on the surface of the metal: to which however the ashes of the greafe must be supposed to have added some little quantity. There is, nevertheless, another body with which, the putty or calx of tin may be adulterated, that will not discover itself by this method of reduction of the tin. It is white lead, which, in this manner of treatment, would run into fusion, and mix with the tin; and could therefore not be distinguished from it. But it may be easily rendered perceptible by another manner of proceeding: which, is to take the putty suspected to be adulterated with it, and having put it into a crucible, without any admixture, and inverted another crucible over it as a cover, to give it a moderate heat, carefully avoiding that the smoke or coal of the fire may have any access to it to change its colour. If there be any white lead mixed with the putty, it will shew itself, when removed from the fire and become cold, in a yellow or brown colour: and if no such colour supervene, but the putty appear equally white as before it was heated, a conclusion may be safely made, that it was not adulterated by white lead; but, if sophisticated at all, by
some

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some white earth, which may be made perceptible by the reduction of tin in the manner before mentioned.

Where a very pure white is wanted for enamel, the easiest and best method is to calcine the tin by means of nitre; which may be thus done.

“ Take half a pound of salt petre, and
 “ put it into a melting pot, such as is described p. 240; and put it into a fire to
 “ melt it. When it is melted, throw in gradually ten ounces, or a half of a pound of
 “ tin filings, which should be rasped as fine
 “ as possible; but give time for the explosion,
 “ that will follow, to cease betwixt each
 “ quantity that is thrown in; stirring, however, the matter in the mean time with the
 “ end of a tobacco pipe. After the whole is
 “ put into the melting pot, stir it again well
 “ about for some time; and then take it out
 “ of the fire; pouring all the matter out of
 “ the pot, that can be got from it by that
 “ means; and then soak the pot in water till
 “ the remainder be soft enough to be scraped
 “ from it: taking great care not to let any
 “ part of the substance of the pot be commixed with the calcined matter. That
 “ which is moistened in order to be got out
 “ of the pot, must be dried, and put to the
 “ other, and the whole well pounded; and
 “ kept stopp’d up in a bottle for use. There
 “ is no occasion for edulcoration, or washing
 “ the salts from the calx, for this purpose,
 “ because

“ because they are by no means detrimental,
“ but rather advantageous to the enamel.”

Antimony has been also applied to the same use as tin : but the expence and trouble of reducing it to a calx, which must be by deflagrating it with nitre, renders the use of tin much more expedient. Merret in his notes on Neri, recommends equal parts of the antimony and nitre ; but as that proportion does not calcine the antimony to whiteness, but produces the *crocus metallorum*, or liver of antimony, which is of a foul orange or reddish yellow colour, it is by no means sufficient : he says likewise, that *regulus* of antimony will answer the same end ; but in this he is still further mistaken ; for the *regulus*, which is a metallic body, in some degree malleable, could never be reduced to powder, as he directs all the ingredients in the composition he prescribes to be : nor if it were, would it form a white body on the fusion with the other matter.

When antimony is used for the colouring white enamel, it should be previously calcined by means of nitre, in the following manner.

“ Take of antimony one part, salt petre
“ three parts. Powder them well together ;
“ and then throw it, by a spoonful at a time,
“ into a crucible heated red hot ; waiting be-
“ twixt each time till the explosion the mix-
“ ture will make be entirely over. When
“ the whole matter is put into the crucible,
“ and has remained some time in a quiet
“ state, take it out of the fire ; and proceed
“ in

“ in all respects, as was above directed for the tin, when calcined in this manner.”

The calx of antimony so produced will be of a finer white than the calx of tin can be easily brought to, unless by this method of calcination: and therefore more fit for purposes, where great purity of colour is wanted, either in grounds or painting. But as the tin prepared in the same manner may be rendered very white, it will be less expensive, as it requires less nitre to calcine it, and produces a much greater proportion of calx than the antimony.

Arsenic is also used for forming a white colour in enamel: but it is a very nice matter to manage it well; as it is very soon changed by the heat into a transparent body, being itself a strong flux; and it is therefore much better to omit the use of it, unless for some particular purposes, in the state of white glass, as I shall below have occasion to mention. Arsenic is also used as flux: but its effects on some colours renders it not very safe without great knowledge of its qualities, and caution in its application.

Of the substances used for producing red, blue, yellow, &c. colours in enamel.

Ultramarine (the preparation of which we have before given) is used in enamel, where very bright blues of a lighter teint is wanted; and sometimes, indeed, in other cases, by those

those who do not understand the right use of zaffer and smalt: but there are few instances where zaffer, when perfectly good, fluxed with borax and a little calcined flint, or Venetian glass, to take off the soluble quality of the borax, will not equally well answer with the best ultramarine. The ultramarine requires no preparation when used in enamel painting, previously to its being mixt with the proper flux: and what relates to its general qualities, and the means of distinguishing its goodness or genuineness, we have, along with its preparation, before taught, p. 67, and the following.

Zaffer is used for producing blue, green, purple, and black colours in enamel. It is an earth obtained by calcining a kind of stone called *cobalt*; and when it is mixed with any kind of vitreous bodies, it vitrifies; and at the same time assumes a strong blue colour; but for the most part verging to the purple. It is to be had, in a state proper for use, of those colourmen who make it their particular business to supply the glass-makers with colours. The goodness of zaffer can scarcely be known but by an actual trial of it; and comparing the effect of it with that of some other known to be good and used in the same proportion.

Magnesia is an earth, which, when fluxed with any vitreous body, produces a broken crimson, or foul rose colour. It is to be had, prepared fit for use, except a more perfect levigation from those who sell colours to the glass-maker. It is useful not only for some purposes

as a red, but for several compositions for black, purple, and some browns. The goodness of magnesia must be determined, by the same means as that of zaffer.

Smalt is zaffer vitrified with proper additions; which are generally fixt alkaline salts and sand, or calcined flints; and is sometimes used as a blue in enamel: but being hard, it requires, for such purposes, to be used with a flux; which increasing the body of glass in too great a proportion for the tinge, is apt to dilute the colour too much, where great force is wanted: and therefore the use of the zaffer itself is in most cases preferable. Smalt, however, ground very fine, and mixt with a fourth part of its weight of borax, (which is much the most powerful and kindly flux for zaffer) will run pretty well, and may be used where either a full colour is not demanded, or where the work will admit of the colours being laid on thick. The goodness of smalt may be judged of by its bright and deep colour; and the less it inclines to the purple the better. In order to judge of the strength of the colour, the smalt should be reduced to a fine powder: for in a grosser state, every degree of fineness renders it so different, that a judgment cannot be easily formed of it. Smalt is to be had of all colourmen, and is not subject to adulterations, which would not be obvious on inspection.

Gold is used in enamel to produce a crimson or ruby colour; which, by the mistaken sense

sense of the Latin word *purpureus*, has been called *purple* by all the English and French writers. It must be previously reduced to the state of a precipitated powder, by dissolving in aqua regia; and making a precipitation by means of tin, fixt alkaline salt, or some other metallic or alkaline body. There has been several methods used for the making this precipitate of gold; but the following will perfectly answer the end with great ease and certainty.

“ Take of pure spirit of nitre eight ounces.
 “ Add to it of sal ammoniacum scraped perfectly clean and powdered two ounces; which
 “ will convert the spirit of nitre to aqua regia.
 “ Dissolve, in four ounces of this aqua regia,
 “ put into a proper phial, half an ounce of
 “ purified gold, in the state it is to be had of
 “ the refiners, under the name of *grain gold*.
 “ In order to hasten this solution, the phial
 “ may be put into a gentle heat, where it
 “ must continue till the gold intirely disappear. Take, in the mean time, about the
 “ same quantity of aqua regia in another phial;
 “ and put into it filings or small bits of pure
 “ block tin, so long as any brisk effervescence
 “ arises on the adding fresh quantities: but
 “ this must be done gradually, especially if
 “ the filings be used; otherwise the mixture
 “ will heat so much as to boil over or break
 “ the phial. Drop then thirty or forty drops of
 “ the solution of the gold into a half pint glass
 “ of water; and immediately after about fifteen
 “ or

" or twenty drops of the solution of tin. The
 " gold will be then precipitated in a red pow-
 " der from the solution in the aqua regia
 " dropped into the water ; and this operation
 " must be repeated till the whole quantity of
 " the solution be thus treated. When the last
 " quantity of the red powder has been preci-
 " pitated, pour off the clear fluid ; and fill
 " the glass with spring water : which, when
 " the red powder has settled, must be poured
 " off likewise. Hold then a sponge wet, but
 " well squeezed, to the surface of the fluid re-
 " maining with the powder ; and when as
 " much of the water as can be conveniently
 " separated from it, by that means, is drawn
 " off, lay the powder on a marble or porphyry
 " stone to dry : taking great care that it con-
 " tract no dust or foulness."

Instead of using the solution of tin to precipitate the gold, the crude tin is most frequently employed : but the precariousness of this method, which requires much more attention, overbalances the trouble of making the solution. For if the solution be mixed with as much water in this method as in the other, it is very slowly acted upon by the tin : and if the solution be not diluted with so much water, it forms a gelatinous body, when strongly saturated with the tin, which can never be separated from the precipitated gold, but by means that are destructive of its qualities as an enamel colour. When the crude tin is used, however, the solution must be di-
luted

luted with about treble its quantity of water; and the tin must not be longer continued in it, than while the gold appears to form a red powder on the surface of it, on its being freed from that which before adhered to it. It is better, nevertheless, on the whole, to use the two solutions: as it is more easy to preserve a scarlet colour, by that means: for if the tin be too long continued in the mixture, it gives the colour a tendency to the purple. When a red colour is wanted, which verges greatly on the purple, a precipitation of the gold should be made by means of any fixt alkaline salt. Which may be thus done.

“ Take the solution of gold in aqua regia,
 “ as before directed: and drop in it a solu-
 “ tion of salt of tartar (which must be made
 “ by melting half an ounce of salt of tartar in
 “ a quarter of a pint of water) so long as
 “ there appear any effervescence or ebullition
 “ or the further addition. Let the precipi-
 “ tated powder then settle; and proceed as
 “ was above directed for the calx cassii, or
 “ precipitation with tin. The powder thus
 “ produced is called *aurum fulminans*, from
 “ its quality of exploding when exposed to a
 “ moderate heat: which must therefore be
 “ carefully guarded against in the use of it,
 “ by keeping it out of the reach of any such
 “ heat till it be mixed with the flux for en-
 “ ameling: and it will be the less hazardous
 “ from being thoroughly well freed from the
 “ salt, formed in its production, by washing.”

The gold may be likewise precipitated, in the same manner, by volatile salts: in which case the volatile salt in the proportion of half the weight of the aqua regia may be dissolved in four times its own weight of water. But this method does not produce so scarlet a red in the gold precipitation, as that of using the solution of tin, as before directed.

This precipitation may be also made by mercury dissolved in aqua regia; and it is said that a finer colour is produced by this method than with tin: as likewise, that if the aurum fulminans, or any of the other precipitations, be fused with common sulphur, they will be rendered of a much brighter red; but the sulphur must in this case be suffered to burn away. These methods, nevertheless, are attended with much more difficulty and hazard than the simple method first given; and, perhaps, unless by accidents not be commanded, will not produce a better pigment for enamel painting.

Besides the application of gold to form a red colour, it is used to produce the effect of gilding in enamel; for which purpose it must be reduced to the state of a precipitated powder in the following manner.

“ Take any quantity of gold dissolved in
 “ aqua regia, as mentioned above. Put
 “ into it long slips of copper plates; and con-
 “ tinue them there till the gold no longer
 “ appear to form itself in a powder on their
 “ surface :

“ surface: in order to the observing which,
 “ the gold already cohering, must be from
 “ time to time shaken off; or they may re-
 “ main till they no longer appear to excite
 “ any effervescence or bubbling in the fluid.
 “ The slips of copper being then taken out,
 “ the water must be poured off from the pre-
 “ cipitated powder, and several fresh quanti-
 “ ties added to free it intirely from the salt
 “ formed by the aqua regia and copper: after
 “ which it may be dried, and will then be
 “ fit for use.”

Silver is used for producing a yellow colour
 n enamel. It must be previously reduced to
 he state of a powder: which may be done
 either by precipitation from spirit of nitre, or
 by calcination with sulphur. The precipitation
 of silver from spirit of nitre, may be perform-
 ed by dissolving an ounce of silver, in two or
 hree ounces of spirit of nitre; and precipi-
 ating and edulcorating it exactly in the same
 nanner, as was above directed for precipitating
 he gold from aqua regia, by means of cop-
 per for gilding in enamel. A precipitation
 may otherwise be made by pouring brine on
 he solution of silver in the spirit of nitre: but
 I think the other method preferable. The
 calcination of silver with sulphur may be thus
 performed.

“ Put plates of silver into a crucible, with
 “ as much of the flowers of sulphur betwixt
 “ them as will cover the surface of each plate:
 “ and then place the crucible in a fire, that

“ will heat it red hot. When being taken
 “ out, the silver will be friable or brittle, and
 “ must be reduced to a fine powder in a
 “ mortar of glass, agate, or flint. The cal-
 “ cination may be otherwise made, by mix-
 “ ing filings of silver with flowers of sulphur,
 “ in the proportion of one ounce of the silver
 “ to half an ounce of the sulphur; and heat-
 “ ing them red hot in a crucible; or the sul-
 “ phur may be thrown in to the crucible after
 “ the silver is already made red hot.”

Copper is used, in enamel painting, for the forming green, blue, and red colours: but it must be previously either calcined, or reduced to the state of a powder by precipitation. The calcination may be performed, by means of sulphur, in the same manner as is above directed for silver: but it requires a strong fire for two hours: when the copper will be found converted into a blackish red powder, which must be well levigated by grinding and sifting. When the copper is so prepared, it is called *Ferretto of Spain*. It may be otherwise calcined by stratifying it in the same manner with Roman vitriol: but a much longer continuance of fire is required in this method: and Neri says it ought to be six times repeated to have the ferretto perfectly fine. When all this is done, nevertheless, the substance produced cannot be really different, notwithstanding the intimation of Neri to the contrary, from that of copper calcined with sulphur; if the quantity of sulphur employed be small,
 and

and the time of the calcination well adjusted; which must be judged of by the goodness of the ferretto when prepared; the criterion or mark of which, is its appearing red when levigated: for if it verge to the black or purple, either the calcination has been too long continued, or the proportion of sulphur employed was too great.

Instead of crude copper, the kind of latten called, by artificers in metals, *assidue*, may be used: but as the plates of it are too thin to be treated in the way of stratification, or layers, as the quantity of sulphur used would be much too great a proportion, it is better to clip the *assidue* with scissars into small shreds; and mix it by that means with the flowers of sulphur: and the extreme thinness of the plates, in this case, renders the necessary time of calcination very short.

Copper or brass in thin plates, latten, or *assidue*, may be, likewise, calcined without sulphur, by exposing them to a strong heat for a considerable time. But as soon as the heat has rendered them friable or brittle enough to bear levigation, it is the best way to powder the matter, and place it again in the fire thinly spread on a tile, or other such convenient thing; stirring it sometimes, that every part may be exposed to the open heat; and, by this means, the calcination may be much accelerated: a due regard should be had likewise in this case to the red colour of

the calcined matter, as well as in the case of that calcined with sulphur.

But, notwithstanding, that it is requisite, for many purposes, to have the copper calcined only to a state of redness: yet it may be expedient, likewise, for some particular uses, to prepare other quantities with a higher calcination; which must be continued till the copper appear a dark purplish grey, or light black when powdered: but it must yet retain some tinge of the red: for if the calcination be pushed beyond that point, the calx becomes very difficult to be fluxed; and does not afford any colour in a kindly manner to the enamel.

The other method of reducing copper to an impalpable powder, is by precipitation: to which end, the copper must be dissolved in any acid, (for all will dissolve it) and precipitated, by adding of a solution of pearl-ash in water, in the same manner as was directed p. 86, for making the kind of verditer called *Sanders blue*, except in the use of starch, which must be here omitted: and for making green colours in enamel, this will be found preferable to the calcined copper.

To avoid the trouble of dissolving the copper as above advised, Roman vitriol, which is only a combination of copper with oil of vitriol, may be used in the place of such solution. It must be previously dissolved, by adding hot water to it in a powdered state: and then the copper may be precipitated, by
means

means of pearl-ashes, in the same manner as from any other solution of it.

Iron is used to produce an orange red, or foul scarlet colour in enamel; as also a transparent yellow; and to assist, likewise, in the formation of greens, and other compound colours. It is prepared many ways, both by corrosion, and precipitation; some of which indeed make a real difference, but most of them lead to the same end. The only difference in fact, is, that when the iron is highly calcined, and freed in a great degree, not only from all acid, but even its own sulphur, the appearance of the crude calx will verge most upon a purple colour; and produce a foul purple enamel, if compounded only with a quantity of flux not sufficient to vitrify it; but when compounded with a greater quantity of flux, will vitrify into a transparent yellow, somewhat inclining to the red: whereas when it is less, or not at all calcined, but retains its own sulphur, or perhaps some proportion of acid used in the preparation, it will in proportion be yellow, or verge towards the yellow, when used with the less proportion of flux, and produce a cooler or less red yellow, when used with a quantity sufficient to vitrify it. Instead of using the crude iron in these preparations, where it is to be precipitated, or calcined, it is much better to use common green vitriol; which consists only of iron and the acid of vitriol; from whence consequently the iron may be obtained in the state,

to which these preparations lead, by easier and less expensive means, than when used crude. But the preparation of the rust, formed by vinegar, requires the iron itself; and if found necessary, is, nevertheless, the only instance where the precipitated basis of vitriol will not answer the same end as the iron.

The first preparation of iron is, therefore, the rust by corrosion with vinegar, which may be thus made.

“ Take of iron filings any quantity; the
 “ finer they are the less trouble they will give
 “ in the preparation; and sprinkle them with
 “ vinegar, rubbing them together after it is
 “ added, that every part may be moistened
 “ equally. Spread them, in any cool place,
 “ where they may be free from dust, on a
 “ board or paper; and let them remain there
 “ till the moisture appear to be dried away:
 “ and then try if they be so corroded as to
 “ bear powdering: which, if it is found prac-
 “ ticable, must be performed on a porphyry
 “ stone with a muller, or in a glass or agate
 “ mortar: but if they appear not sufficiently
 “ corroded, they must be again moistened
 “ with vinegar; and laid out as before; and,
 “ when become fit, powdered in this manner.
 “ The powdered rust must then be sifted
 “ through a fine sieve; and the grosser part,
 “ which will not pass, moistened again with
 “ the vinegar: which must be repeated till
 “ none of the iron worth further notice re-
 “ main uncorroded. The whole must then
 “ again

“ again be levigated, till it be a perfectly impalpable powder; which will be then fit for use.”

The iron prepared thus by vinegar, is proper for making a transparent or glazing yellow in enamel: or for compounding with blues to form green colours. But this process is greatly more troublesome and laborious than those below given: and is attended with no benefit in the produce, except that this rust will afford a cooler or less red yellow than the others; and may therefore be of advantage in some particular cases, for forming very bright greens.

It has been usual to calcine the rust, prepared thus with vinegar, to form what is called the *crocus martis*; but it is a very injudicious method of proceeding; because where calcination is to be used, the vitriol, or the iron corroded by sulphur, are equally good, and save a considerable trouble and delay.

Iron is sometimes calcined per se, that is, without any mixture, by exposing the filings spread with a large surface to the action of flame for a considerable time; which converts the iron into a *crocus martis*, that, when levigated, is fit for use. But this preparation is also troublesome, and inconvenient; requiring a strong and continued fire: and, when made, affords nothing but what may be much easier obtained by the methods below given.

Iron is also calcined by means of sulphur, which must be performed in the same manner

ner as was directed above, p. 260, for the calcined copper. There is not, nevertheless, any difference betwixt this and the calcined vitriol.

The precipitation and calcination of green vitriol are the most expedient preparations of iron ; and answer all the purposes of the others fully, except in the instance before mentioned of not producing quite so cool a yellow, as the rust formed by vinegar. The precipitation of vitriol may be formed in the following manner.

“ Take any quantity of green vitriol ; and
 “ dissolve it in water. Add to it gradually a
 “ solution of pearl-ashes in water, (which
 “ need not in this case be purified if the salts
 “ be clean) till no more effervescence arise ;
 “ and then pour off the fluid when the pre-
 “ cipitated powder has settled. The remain-
 “ ing fluid, which cannot be poured off, may
 “ be separated from the powder by means
 “ of a filter ; and the powder then dried :
 “ for as the salts will be no way injurious to
 “ the enamel, there is no occasion for wash-
 “ ing in this case.”

This oker or precipitated iron will nearly answer the same end as the rust by vinegar ; and will afford a transparent yellow almost as cool : this is therefore the best and much the easiest preparation of iron for forming greens—by the admixture of blue.

The calcined vitriol must be prepared from crude vitriol, where a red colour is wanted, in the same manner as was before directed,

p. 49, for the scarlet oker, which is itself indeed the substance in this case wanted; and will either afford, with less flux, a red colour in enamel, verging to the orange, or with more flux a transparent yellow of the warmer cast. But where calcined iron is wanted, for forming more purple tints, the precipitated oker, as produced by the above means, should be taken; and calcined with a strong fire, till it acquire the degree of purple desired: to which it may be brought by a much shorter calcination than any other preparation of iron.

Antimony is used for producing a yellow colour in enamel, as well as the white before mentioned: and, indeed, is the most useful, and most used of any substance whatever for that purpose. It is prepared only by levigation; to which its texture, notwithstanding its being a semi-metal, very well suits it. An orange colour, but not bright, may also be produced by antimony calcined with an equal weight or less of nitre, and then separated from the scoria that will surround it, and levigated. But as there are methods of compounding these colours from other necessary preparations, there is no great occasion to have recourse to this. There is a great difference in the antimony itself in different parcels: some being greatly debased by mineral sulphur; and others more free from it. That is best which is striated, and has more the appearance of metal; or rather seems formed from needles laid parallel to each other; the blacker and more
spongy,

spongy, being more impregnated with crude sulphur. But the antimony is so cheap, that it is of no consequence, if the better part only of any parcel be used, and the rest thrown away : and one side in almost every lump is good ; as, in the fusing to separate it from the oar, the most metalline part of course subsides and sinks to the bottom of the mass.

Glass of antimony is also used sometimes in enamel painting : being itself a fine transparent orange colour. But as it wants body, it has no great effect but in compositions. They who have occasion for this glass may purchase it at so easy a rate as renders it scarcely worth while to prepare it themselves ; being manufactured at Venice and elsewhere in very large quantities by those who make it their business. The only care should be to chuse such as is not adulterated by the admixture of glass of other kinds, which may be distinguished by the force and deepness of the colour ; or the want of them.

Mercury is sometimes also used in enamel painting ; but it requires to be prepared by some chemical proccs before it can be used. There are two preparations already practised for medicinal purposes, which fit it also for enamel painting the best of any : the produce of one is called turpeth mineral ; for which we have already given the process p. 100 : by a careful treatment of which a fine cool yellow may be produced in enamel : the other affords the red precipitate ; which is a fine scarlet red, but extremely tender with respect

spect to the fire. As this substance can be procured at a very moderate rate, of those who vend it as a medicine, and requires a particular nicety in the operation, I shall wave giving any process for it here; especially as every book which treats of the chemical pharmacy contains one : and indeed the use of both this, and the turpeth mineral, demand so delicate a management of the fire, and are so liable to have their effect destroyed by a second burning, (if, as is so frequently the case it should be necessary,) that I cannot greatly recommend them in preference to other preparations, which will answer the same ends nearly as well with ease and safety.

Orpiment has been also used in enamel for producing a yellow colour : but it is very tender with regard to the fire ; and requires so soft a flux, while at the same time antimony, properly managed, will so well supply the place of it, that it is rarely used.

Powdered bricks have been also used for compounding yellow colours in enamel ; but as they act only in consequence of the oker they contain, they are certainly inferior to the prepared okers we have given : especially as they are liable to great impurities ; and are harder, or require a greater force of flux, than the pure okers or calcined iron. When they are used, they should be chosen of the reddest colour, the softest and evenest texture, and intirely free from all stones or cinders. The Windsor bricks, therefore, are much the best, that

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that are to be procured here; as they answer to the circumstances required much better than any other.

Tartar is also used. in forming enamel colours: tho' not from any tinging quality it has in itself; but for its effect in modifying magnesia, and some other substances. The crude red tartar should be chosen for this purpose; and requires no other preparation, but to be freed from all impurities and well levigated.

These are the several substances that are materially necessary for composing as well the grounds as colours and fluxes in enamel. There have been many other introduced into the practice of particular persons; and some indeed into more general use; and the preparations of those have been likewise greatly varied and multiplied: but what I have given are more than sufficient for every purpose; as all the variety of tints, with all the degrees of the attendant qualities, may be produced by a proper application of them. And the increasing unnecessarily the number of simples and original preparations can only lead to confusion and embarrassment. But whoever acquires a moderate knowledge of the principles and subjects here laid before them, may easily proceed to examine or use any other colouring substance, which is fitted by its texture to endure the heat of vitrification.

S E C.

SECTION IV.

Of the compounding and preparing the fluxes for enamel painting.

[N order to the understanding, and consequently managing more advantageously, the several compositions for fluxes, it will not be improper to inquire a little more particularly into the nature of the ingredients, and their operation on each other; as well as the proportion of power each has in producing its proper effect: since by this means, the several mixtures may be better adapted to the purpose, on each occasion, when their nature and degree of efficacy is well understood, than they possibly can by any particular recipes; though in order to give such an initiative knowledge of each particular, as may lead to proper experiments, I shall subjoin a complete set, as well for the preparation of these, as the colours.

There are two kinds of substances in the composition of enamel fluxes. The one included with a great propensity to run into the vitreous fusion, or be converted into glass: which is not merely a passive capacity of soon becoming glass itself; but when become so, of changing and assimilating other bodies commixt with it to its own vitreous nature. This kind consists of salts, lead, and arsenic: but as salts, when vitrified alone, or with a small

proportion of other bodies, are still liable to be dissolved by aqueous moisture, and as glass under the same circumstances, is extremely apt to suffer a corrosion by the air, and turn black and dull on its surface, it is necessary to combine some other bodies with them; which may counteract these bad tendencies; and render the composition durable under all circumstances. These corrective bodies of the proper matter of the flux, which therefore make the other kind of substances enamel fluxes are composed of, are calcined flints, sand, or such calcarious matter: which being perfectly white and resisting, in a vitreous state, the corroding or dissolving action of all menstrua, give body and firmness to the fluxing composition without discolouring, or any other way changing the proper fluxing ingredients; except by weakning, in a certain degree, their vitrefactive power; and consequently rendering them somewhat weaker as fluxes, than they would be alone.

The most active flux amongst salts is borax: which, indeed, possesses this power in the greatest degree hitherto known of any simple whatever. The next is lead; which vitrifies with a very moderate degree of heat; and assimilates to glass with itself, not only many kinds of earths, but all metals and semi-metals, except gold and silver in their intire state. Arsenic is the next powerful flux, or perhaps the next; only it requires to be fixed by being mixed with some other body already vitrified,

vitrified ; otherwise it sublimes and flies away before it arrives at the vitrefactive heat. The several kinds of other salts have the next degree of fluxing power ; and among them sea salt possesses the greatest : but they are not sufficiently strong themselves to form an enamel flux soft enough to be used in painting : though as they are colourless, which is not the case of vitrified lead, they are very necessary to be compounded with lead ; or used in its place, assisted by borax, where absence of every degree of colour is necessary in the flux.

Of the general method of preparing fluxes.

The method of preparing the several fluxes below given is the same. The ingredients are to be well levigated with each other, on a porphyry stone, with a muller of the same matter, or of flint ; or in a mortar of agate, or flint with an agate pestle : though where great quantities are to be prepared, a mortar and pestle of the common green glass may be previously used.

Being levigated, the matter should be put into pots of a proper size, made of the substances, and in the manner, directed p. 240 ; and placed in a furnace where the heat is nearly that of a strong culinary fire : for though a greater heat accelerates the vitrification, yet it renders the composition harder, that is, weakens its fluxing power. When the vitrification is perfect, which must be known by the mat-

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ter's

ter's becoming transparent, and free from air bubbles, it must be taken from the fire ; and poured out on an iron plate clear of any rust : and then, being powdered when cold, if the operation appear to have succeeded, it must be kept for use ; but, if any turbidness or foulness appear in particular parts, such parts should be picked out ; or, if the whole be depraved with specks or cloudy, it should be again powdered and fused ; and then treated in the same manner as at first.

Of glass of lead.

Simple glass of lead, though a soft flux, is not proper to be used alone : for the air, as was before mentioned, corroding it, a cloudiness or skim is apt to come on the surface ; which gives a dulness and unpleasing appearance to the enamel ; and sometimes fouls the brighter colours. As it forms, however, in a more compound state, one of the best fluxes, the preparation of it simple is necessary to be known : for though the ingredients which compose it might be fluxed together with the other ingredients of the fluxes and colours ; yet it is better to vitrify it separately first, and consequently purify it from those feculencies and dross, which are apt to be formed in the first fusion. The manner of preparing glass of lead, such as is to be understood to be meant in the succeeding recipes, is as follows.

“ Take

“Take of red lead two pounds, of flints calcined and levigated as above directed p. 247, or, in default of flints, of white sand ground to fine powder, one pound: vitrify and prepare them according to the general directions before given.”

Composition of a flux, for common purposes, moderately soft.

Nº 1.

“Take of the glass of lead one pound, of pearl ashes six ounces, of sea salt two ounces. Treat them according to the general directions for fluxes.”

This is a very cheap flux; and will serve extremely well for all purposes where a tinge of yellow will not be injurious; or where the flux is not required to be extremely soft.

Composition of a soft flux for common purposes.

Nº 2.

“Take of the glass of lead one pound, of pearl ashes six ounces, of borax four ounces, of arsenic one ounce. Proceed according to the general directions.”

This is a very soft flux; and will vitrify a very large proportion of zaffer, or the precipitated powders, or calxes of metals. It is, therefore, very proper for forming strong glazing

T 2 colours,

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colours, where harder fluxes are used with the rest : or for all purposes, where there is any necessity for, or convenience in, burning the enamel with a slighter heat.

Composition of a transparent flux, perfectly white, and moderately soft.

N° 3.

“ Take of common flint glass powdered
“ one pound, of pearl ashes six ounces, of sea
“ salt two ounces, of borax one ounce. Pro-
“ ceed as with the others.”

This is proper for purples, crimsons, and such colours as are injured by any tinge of yellow ; as also for white, where purity is required. It is rather harder than N° 1 above given ; but that may be corrected where necessary by any intermediate proportion of borax, betwixt that given here and in the next.

Composition of a transparent flux perfectly white, and very soft.

N° 4.

“ Take of common flint glass powdered
“ one pound, of pearl ashes and borax each
“ four ounces of common salt and arsenic each
“ two ounces. Mix, and flux them according
“ to the general directions : but they must re-
“ main in fusion longer, if any cloudiness ap-
“ pear

“ pear in consequence of the arsenic; which
 “ though indued with a strong fluxing power,
 “ when in a vitreous state, does not neverthe-
 “ less vitrify, when the proportion is large
 “ with respect to the other ingredients, so
 “ quickly as they do; but gives a milky tur-
 “ bidness to the glass, till its own vitrification
 “ be perfect.”

This is a very soft flux; and proper in all cases, where such is necessary, and the yellow tinge of the common soft flux above given would be detrimental. But the proportion of borax or arsenic may be varied as is above intimated, either in this, or any of the other compositions; or the arsenic, and sea salt, omitted according to the occasion: but the proportions of the other ingredients should be adhered to; because they are such as are most advantageous with respect to the relations the qualities of each have to the others, and to the general intention.

Of the white Venetian glass, as a flux.

The principles on which fluxes are formed, and the nature of the substances proper to form them, having been very little understood, or indeed known, and the compositions of the fluxes used having been kept secret at Venice, and Dresden, or by the few elsewhere who have learnt them, it has been almost universally practised to use the white Venetian glass as a flux: but it has not, that I know of, been

lately imported into this country, or any where regularly sold for this purpose ; but obtained, by those who use it, by seeking out drinking glasses, small vases, or other such wrought pieces : and indeed I am in some doubt, whether the same glass be now made at Venice, or any where : but that what is found is the remains of a kind formerly made, and dispersed all over Europe, while the Venetians had the the monopoly of such sort of manufactures wholly in their hands. This glass is of a moderate softness ; and agrees very well with the colours in general : but having a milky turbidness must certainly be less advantageous to the transparent or glazing colours than a flux perfectly pellucid. The composition of this glass is not known at present to any here ; for all the kinds described by Neri seem much harder than this ; though, as he gave all the compositions then in use in Italy, and particularly understood the Venetian manufacture, one might have expected he would have taken it in, as it must have been made in very large quantities from the copious remains of it we find in every part of Europe. This glass may be known, from any common kind, by its having a milky turbidness ; by which it may be distinguished from all transparent sorts ; and by its yet coming much nearer to transparency, than any of the white opaque kinds made at present.

SECTION V.

Of the composition, and preparation of white enamel for grounds, and other purposes.

Composition of common white enamel of moderate hardness.

Nº 1.

TAKE of glass of lead one pound,
 of pearl ashes and calx of tin each
 half a pound. The ingredients being thoroughly mixt, by grinding them together on a porphyry stone, or by pounding and rubbing them well in a glass mortar, put them into a proper melting pot; and give them a moderate heat, till they incorporate thoroughly: but the fusion should not be either strong, or long continued; for, if the glass be perfectly liquified, the calx of tin is apt to subside; and, consequently, to be unequally mixt in the mass when cold. When the heat has had its due effect, take the pot out of the fire; and pour the matter on a clean iron plate; or into molds to form it into cakes, like the Venetian enamel, if it be so desired."

This is softer than the common white glass, and about the degree of the common Venetian enamel. It is not very white, nor consequently fit for dial-plates, or other purposes

where the clearness of colour is required : but for paintings where it will be covered, or where pure white is not necessary, it will extremely well answer all purposes.

Composition of a very soft white enamel for common purposes.

N^o 2.

“ Take of glass of lead one pound, of pearl
 “ ashes and calx of tin each half a pound, of
 “ borax and common salt each two ounces, and
 “ of arsenic one ounce. Treat them as the fore-
 “ going: but be very sparing of the heat; and
 “ take the matter out of the fire as soon as it
 “ forms one homogeneous mass, without suf-
 “ fering it to fuse till it be perfectly fluid.”

This is very soft; and will scarcely admit, if used as a ground, the fluxing of colours upon it without running into fusion itself with the same heat; and, consequently, mixing with, and depraving them: but where it is used without any view to painting over it, either in its own proper colour, or mixed with any other, particularly with black, it is preferable to hard enamel; because it can be worked with a much less heat; and consequently is both more easy to be managed, and less liable to give occasion to the warping or calcining the metal plates, or other bodies, on which it laid.

Composition

Composition of enamel, of moderate hardness, but more perfectly white.

N^o 3.

“ Take of flint glass one pound, of calx of tin or putty of the first degree of whiteness half a pound, of pearl ashes and common salt each four ounces, and of borax one ounce. Treat them as the foregoing : but the fire may be more freely used than in the case of the last.”

This enamel, if the calx of tin or putty be perfectly good, will be very white; and is proper for dial-plates, or other such uses ; where the purity of the white ground is essential to the value of the work : and it will, also, bear colours very well, where such a ground is wanted for any painting : but if it be found too soft, in proportion to the fluxes of the colours, it may be prepared of a greater degree of hardness by omitting the borax.

Composition of soft enamel more perfectly white.

N^o 4.

“ Take of flint glass one pound, of pearl ashes and common salt each four ounces, of borax two ounces, and of arsenic one ounce. Treat them according to the general directions; but be sparing of the fire as with N^o 2.”

This

This is too soft for a ground for colours : but is fit for any other purposes where enamel of greater whiteness is required ; as also for using with other colours where there is occasion to paint with white.

Composition of a very soft enamel, of the first degree of whiteness, proper for painting.

N^o 5.

“ Take of flint glass one pound, of anti-
 “ mony calcined to perfect whiteness accord-
 “ ing to the directions in p. 251, or of tin
 “ calcined with nitre according to the direc-
 “ tions in p. 250, half a pound, of pearl ashes
 “ and common salt each three ounces, of bo-
 “ rax three ounces, and of arsenic one ounce.
 “ Proceed according to the general directi-
 “ ons : but be very careful to avoid such a
 “ fusion, as will render the matter perfectly
 “ liquid.”

This composition produces an enamel extremely white, and very soft ; and is proper to use, in painting, for linnen, or other objects, where strong touches of white are advantageous. If it be found too soft, according to the tone of the fluxes, for the other colours, the arsenic may be omitted, and part of the borax ; but it will, in this proportion, suit the other colours, when the fluxes are judiciously adapted to each kind.

of.

Of common white glass as an enamel ground.

The white glass made at Mr. Bowle's glass-house in Southwork, is frequently used for the grounds of enamel dial-plates, and other painted works. It is a glass rendered of an opaque whiteness by the admixture of a large proportion of arsenic, which, intimately mixed with the glass by a slight fusion not sufficient to produce a vitrific incorporation, retains its opacity; and, consequently, gives a whiteness to the glass; though if the fusion were long enough continued, it would assimilate with the glass, and the whole mass consequently become perfectly transparent. This tendency to lose its opacity, of course renders the use of it, as a ground enamel, more limited and difficult: because where colours are to be used, which require repeated burning, or to be continued a longer time in the fire, there will be a great hazard of changing the opaque whiteness into transparency, or such an approach to it as destroys the effect of the ground: and, indeed, in the burning it, even as a ground, particular care is required in the manner. It is, likewise, harder than the Venetian common glass, or any of the above preparations of ground enamel: as likewise much more brittle, and liable to crack and peel off from the body painted with it: but notwithstanding these disadvantages, its low price, and great whiteness, which much surpasses that of the
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the Venetian, or any enamel commonly to be had, have recommended it to the practice of many, who are concerned in cheaper works of enamel.

SECTION VI.

Of the composition of the colouring substances, together with the proper fluxes, in order to the painting with all the variety of colours in enamel.

Composition for the scarlet or crimson red, improperly called purple of gold.

N° 1.

“ TAKE of the fluxes, N° 1, or 2, or
 “ Venetian glass six parts, and of the
 “ calx cassii or precipitate of gold by tin as directed p. 255 one part. Mix them well together; and paint with them.”

This will produce a very fine scarlet, or crimson colour, according to the tint of the precipitate of gold used: for it may be prepared very scarlet by the means above directed, as I have more than once seen; though as it is commonly prepared, a crimson only is produced; and that frequently verging towards the

the purple. If the effect of red be not strong enough, but the colour tend too much to transparency, it may have a greater body given it by adding more of the precipitated gold.

Composition for transparent scarlet, or crimson colour.

N^o 2.

“ Take the flux N^o 2. six parts, the precipitate of gold with tin one part. Flux them together, with a strong fire, till the whole appear a transparent red glass. Then pour out the matter on a clean iron plate; and levigate it well; when it will be fit for painting.”

This preparation will answer the end of lake in oil painting, either for glazing or making dark shades of red. A greater quantity of the gold precipitate may be added where a stronger force of colour is desired to be had: and the composition must in that case be longer continued in fusion. But the flux will not always vitrify more than this proportion so as to render it perfectly transparent.

If this preparation be mixed, after it has been levigated, with a sixth part more of the gold precipitate, and used without a second fluxing, it will give a very fine deep crimson, extremely serviceable in many cases.

Composition

Composition for a bright orange red.

N° 3.

“ Take of the fluxes N° 2 or 4, two parts
 “ of red precipitate, of mercury one part, mix
 “ them for painting.”

This makes a very bright orange red; but is very delicate, requiring only just so much heat as will run the parts of the flux together; and is therefore difficult to use where harder compositions are to be burnt with it.

Composition for a cheaper but fouler scarlet red.

N° 3.

“ Take of the flux N° 1. two parts, and of
 “ the scarlet oker as prepared in p. 49 one part.
 “ Mix them well together; and avoid too
 “ much or too long heat.”

This is the common red in China, and other enamel paintings. It may be enlivened by mixing one part of glass of antimony with one part of the flux, instead of using the flux alone.

Composition of a cheap crimson.

N° 4.

“ Take of the flux N° 1. four parts, of
 “ magnesia one fourth of a part: and fuse
 “ them

“ them till the whole mass be transparent.
“ Mix them then with one part of copper
“ calcined to redness; and paint with the
“ composition. Where this is required to be
“ transparent, the calcined copper should be
“ vitrified with the other ingredients: but
“ this requires great care to take the composition out of the fire as soon as the vitrification is perfected.”

A little white enamel, or, what is better, a little of the tin calcined, by means of nitre, as in p. 250, may be added, to give the colour a body. But this necessarily dilutes the colour, and weakens the force of it.

This red is very tender; and requires only so much heat as will incorporate the substances together: but if it be found too soft for the tone of the fluxes of the colours, instead of using the flux, flint glass with a small part of flux may be employed for mixing with the magnesia.

The management of this colour is, however, so difficult and nice, where it is used in very light touches, that in nicer paintings it is better to use the precipitate of gold properly broken by the admixture of other colours, where a fouler crimson is wanted, than to be troubled with watching this. But in grosser works, where the colours are used in great quantities, and laid on with a stronger body, this becomes very serviceable.

In the recipes given for the red formed by calcined copper, it has been usual to order an
equal

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equal, or some such proportion, of red tartar; but where the glass contains any lead, I am apt to believe a reduction of it would follow; which would decompose the body of the flux, and render the composition harder. If tartar be used, the flux ought to be formed, therefore, of glass of salts.

Composition for pink and rose reds.

N° 5.

“ Take any of the above compositions;
 “ and add of any of the white enamels, or
 “ of the calx of tin prepared with nitre, or
 “ calx of antimony, as much as shall be sufficient to dilute the colour to the degree required.”

Composition for the brightest blue.

N° 6.

“ Take of the fluxes N° 1. or N° 2. or of
 “ the Venetian glass six parts, of the finest
 “ ultramarine one part. Mix them well for
 “ painting. If a transparent blue be desired
 “ from ultramarine, a sixth or eighth part
 “ must be added to the flux N° 2. and the
 “ mixture kept in fusion till the ultramarine
 “ be perfectly vitrified, and the whole become
 “ transparent.”

If the body of colour be not sufficient, more ultramarine may be added: but in order to spare the ultramarine, a small proportion of zaffer, fluxed with four or six times its weight of borax, may be added: which, if the zaffer be perfectly good, will make the ultramarine appear much darker without impairing its brightness.

Composition of a lighter blue.

N° 7.

“ Take of the fluxes N° 3. or 4. five parts;
“ of ultramarine-ashes one part. Mix them
“ for painting.”

This is used by those, who do not know the proper manner of using zaffer; but as the pure ultramarine-ashes have a strong tinge of the red, and are never of the first degree of brightness, the same effect, or indeed a superior one, may be produced by the compositions below given.

If the ultramarine-ashes are adulterated with copper, as is most frequently the case, a green and not a blue will be produced.

Composition for a transparent blue.

N° 8.

“ Take of any of the fluxes four parts, of
“ zaffer one part. Mix and fuse them with

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“ a strong fire, till the whole mass be perfectly transparent: but, if the quantity of flux be not sufficient to vitrify the zaffer, add more, or a small proportion of borax. When the vitrification of the whole is perfect, pour out the composition, and levigate it for use.”

This will produce a very fine transparent blue; and being extremely deep, will make very strong shades, and give the effect of blackness, where there is a strong body of it laid on.

This may be made with less zaffer, when a less strong effect of the colour is wanted.

Composition of a sky blue.

N° 9.

“ Take of any of the above preparations; and add of any of the white enamels, or calxes of tin or antimony, as much as will be sufficient to produce a blue of that lightness, which may be wanted.”

By forming a blue in this manner, from the composition N° 6. the effect of the ultramarine-ashes may be fully produced as is above intimated.

Composition of azure blue from copper.

N° 10.

“ Take of the fluxes N° 3. or 4. five parts, of copper calcined to a purple colour and
“ of

“ of zaffer each one part. Mix and flux
 “ them well together; and then levigate, with
 “ the mixture, of the calx of antimony or tin,
 “ calcined by nitre, one part; and keep the
 “ matter for painting.”

This is so precarious with respect to the success, that it is rarely used: but it will sometimes produce a good blue; and is then cooler and better for some purposes than the blues formed, either of zaffers and white, or the ultramarine-ashes.

Composition of a bright opaque full yellow.

N^o 11.

“ Take of the fluxes N^o 1. or 2. four parts,
 “ of silver calcined with sulphur as in p. 258,
 “ and of antimony each one part. Mix and
 “ flux them well together till the whole be
 “ perfectly vitrified. Then levigate, with
 “ them, one part of antimony, or tin, calcined
 “ by means of nitre; and keep the matter for
 “ painting.”

This is a full true yellow, and the brightest coloured composition that can be used. It may be made deeper by diminishing the proportion of the calx of antimony or tin.

Composition of a bright transparent yellow.

N^o 12.

“ Take of the fluxes N^o 1. or 2. six parts,
 “ of calcined silver two pars, and of antimony

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“ one

“ one half part. Flux them well till the whole
 “ be transparent: and then levigate the co-
 “ lour for use. Where great transparency is
 “ wanted, the antimony may be omitted.”

This is a very deep bright yellow; and proper for shades or glazing, where great force and purity of colour is required: but for most purposes the cheaper transparent yellow will answer the same end, not being greatly faulty in point of brightness.

*Composition of a bright transparent yellow from -
 silver and iron.*

N^o 13.

Proceed as in the above: only, instead of the antimony, take the precipitated iron as obtained from vitriol according to the directions in p. 266. This will be more transparent in general than the same preparation with antimony; which, differing in the proportion of crude sulphur it contains, does not always submit to be vitrified to a greater degree of transparency. The yellow prepared in this manner will likewise be very cool and true; and consequently proper for forming some kinds of greens.

Composition of a cheaper opaque full yellow.

N^o 14.

“ Take of the fluxes N^o 1. or 2. or Ve
 “ netian glass, six parts, of antimony or
 “ pa

“ part, and of the iron precipitated from vitriol half a part. Mix and flux them well together, till the matter be thoroughly vitrified; and then levigate them with one part of tin calcined to whiteness.”

This will differ only from the yellow of N° 11. in not being quite so bright and full: but will nevertheless be a very strong pure yellow; and fit for all uses, where the greatest brightness is not requisite.

Composition of a warmer opake yellow.

N° 15.

Proceed as in the above, only instead of the precipitated iron, take the scarlet oker prepared as in p. 49.

Composition of a cheaper transparent yellow.

N° 16.

“ Take of the fluxes N° 1. or 2. six parts,
“ and of the precipitated iron one part. Mix
“ and fuse them in a strong fire, till the mass
“ be transparent.”

Composition of a warmer transparent yellow.

N° 17.

“ Take of the fluxes N° 1. or 2. six parts,
“ of scarlet oker one part, and of glass of an-
U 3 “ timony

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“ timony, half a part. Mix and fuse them
“ till the mass be transparent.”

Composition of a transparent yellow from orpiment.

N° 18.

“ Take of the flux N° 2. three parts, and
“ of the refined orpiment or King's yellow
“ one part. Mix them, by levigation, for
“ use.”

This composition is extremely tender, and must have no more fire than will just make the parts of the flux cohere.

If this yellow be desired warmer, a little glass of antimony may be added.

Composition of lighter yellows.

N° 19.

Add to any of the above common calx of tin or putty ; or, if great brightness be necessary, the calx of tin or antimony calcined by means of nitre.

Composition of a very bright opaque green.

N° 20.

“ Take of ultramarine and yellow N° 11,
“ each one part, of the fluxes N° 1. or 2.

“ two parts. Mix them well together for
“ painting.”

Composition of bright transparent green.

N° 21.

“ Take of the fluxes N° 1. or 2. six parts,
“ and of copper precipitated by alkaline salts
“ one part. Mix and flux them till the mass
“ be transparent.”

This will be a very fine deep green ; but
inclining to the blue ; which may be easily
corrected, when not agreeable to the purpose,
by the adding a proper quantity of the tran-
sparent yellows N° 12. or 13.

*Composition of a bright transparent green by
mixture.*

N° 22.

“ Take of the yellow N° 13. and of the
“ blue N° 8. equal parts. Levigate them
“ well together for use.”

Cheaper composition of an opaque green.

N° 23.

“ Take of the fluxes N° 1. or 2. six parts,
“ of copper calcined to a purple colour, and
“ of the opaque yellow N° 14. each one part.

U 4

“ Mix

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“ Mix and flux them well ; and then levigate
“ them for use with one part of calx of tin.”

Cheaper composition of an opake green by mixture.

Nº 24.

“ Take of the yellow Nº 14. and the blue
“ Nº 8. each equal parts.”

By varying the proportion of these mixtures,
sea greens, grass green, or any other tints,
may be produced at will.

Compositions for lighter greens.

Nº 25.

Add the calxes of tin or antimony to any
of the above, in the proportion the lightness
of the colour requires.

Composition for a bright orange colour.

Nº 26.

“ Take of the yellow Nº 12. two parts
“ of the red Nº 1. one part, and of the yellow
“ low Nº 11. half a part. Levigate them to-
“ gether for use.”

N. B. The compositions, which are not
directed to be fused when used alone, must
not undergo any in the mixtures to be made
of them ; but must only be levigated with the
other

other ingredients; and used, for painting, in that state.

Composition for a bright transparent orange.

N° 27.

“ Take of the red N° 2. and of the yellow
“ N° 12. equal parts. Mix them well to-
“ gether.”

*Composition for a lighter transparent orange
extremely bright.*

N° 28.

“ Take of the above and glass of antimo-
“ ny equal parts. Levigate and mix them
“ for use.

Composition of a cheaper transparent orange.

N° 29.

“ Take of the fluxes N° 1. or 2. six parts,
“ of copper calcined to redness one part, and
“ of red tartar one part. Flux them till the
“ matter become transparent; but avoid if
“ possible continuance in the fire a moment
“ longer. Levigate it till it appear red, and
“ mix with it an equal part of glass of anti-
“ mony.”

Composition

Composition of a bright opake purple.

N° 30.

“ Take of the red N° 1. and the blues
 “ N° 6. and 8. each half a part. Mix them
 “ for use.”

Composition of a bright transparent purple.

N° 31.

“ Take of the red N° 2. and the blue
 “ N° 8. Mix them for use.”

Composition of a cheaper opake purple.

N° 32.

“ Take of the fluxes N° 3. or 4. six parts,
 “ of zaffer one part, and of magnesia half a
 “ part. Fuse them, with a strong heat, till
 “ the whole be transparent ; and then add of
 “ the red N° 4. one part, and of calx of tin
 “ half a part. Mix and levigate them well
 “ together for use.”

Composition of a cheaper transparent purple.

N° 33.

“ Take of the fluxes N° 3. or 4. six parts,
 “ of magnesia one half part, and of zaffer
 “ one

“ one sixth of a part. If a red purple be
“ wanted omit the zaffer.”

This, and the foregoing, may both be varied, either to a more red or a more blue purple, by diminishing or increasing the proportion of zaffer. If the last be wanted more red, it may be mixed with a proper quantity of the glass of antimony.

Composition of an opaque brown colour inclining to red.

N° 34.

“ Take of the red N° 3. four parts, and of
“ the blue N° 8. one part. Mix them for
“ use.”

Composition of a transparent red brown colour.

N° 35.

“ Take of the purple N° 33. and glass of
“ antimony equal parts, and of the yellow
“ N° 17. one fifth of a part. Levigate them
“ together for use.”

Composition of an opaque olive brown colour.

N° 36.

“ Take of the yellow N° 14. two parts,
“ of the blue N° 8. half a part, and of the
“ red

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“ red N° 3. a fourth of a part. Levigate
“ them together for use.”

Composition of a transparent olive brown colour.

N° 37.

“ Take of the yellow N° 16. one part, and
“ of the blue N° 8. and glafs of antimony
“ each half a part. Levigate them together
“ for use.”

These may all be varied by changing the proportions of the ingredients; or they may be converted into different teints of light browns, by adding the due quantities of calx of tin: which may be commixt with them when the mixture is made of the other ingredients, or afterwards.

Composition of black moderately hard.

N° 38.

“ Take of the flux N° 1. fix parts, of zaf-
“ fer one part, of glafs of antimony half a
“ part, and of the scarlet oker and magne-
“ sia each a fourth of a part. Mix and fuse
“ them till the matter become a clear black
“ of the deepest cast.”

Composition.

*Composition of black very soft.*N^o 39.

“ Substitute flux N^o 2. instead of N^o 1.
“ and proceed as in the last.”

This composition is extremely well accommodated to the painting enamel dial-plates, or painting on enamel or China grounds in the manner of prints, or chiaro oscuro : for as it will run with a very small degree of heat, the lightest touches may be brought to shew themselves perfectly without the least hazard of fusing the ground so as to run them together.

The above compositions may be diversified, by recombining them with each other, so as to form all the variety of tints to suit every purpose ; and the hardness or softness of the fluxes may be likewise adapted to each occasion by mixing them together. With respect to the proportions in every composition ; they may likewise be varied according to the purposes they are used for ; there being no positive rules to be laid down in these matters with relation to quantities, the different degrees in which different parcels of the ingredients possess the requisite qualities, as well as many other circumstances, preventing the effect from
being

being the same even in compositions exactly the same as far as regards the quantities. I have however endeavoured to give some leading proportions of every kind, by which the necessary mixtures may be adjusted according to every occasion, by a slight consideration on the properties of the ingredients ; which I have, to this end, previously explained ; as the want of such knowledge has in general obliged, even the most skilful and experienced artists who work in enamel, to adhere in many cases implicitly and blindly to the strict forms of recipes, where the preparations have by no means been so well adapted to their purpose as they might have been by slight alterations.

S E C T I O N VII.

Of the manner of laying on and burning the enamel grounds.

THE matter of the enamel must be first finely levigated and searced : and the body to be enameled should be made perfectly clean. The enamel must be then laid on as even as possible by a brush or pencil, being first tempered with oil of spike ; and the distance of time betwixt the laying on the ground and burning the piece should not be too great ; because the oil will exhale and leave the matter of the enamel a dry incohering powder ; which
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will

will be liable to be rubbed or shaken off by the least violence. This is the common method ; but there is a much better way of managing this part of the work by means of a scarce ; in which the enamel is spread with very little trouble ; and the greatest part of the oil of spike saved. The method of performing this is, to rub the surface to be enameled over with oil of spike ; and then, being laid on a sheet of paper or piece of leather, to save that part of the enamel which does not fall on a proper object, to scarce the matter upon the oiled surface till it lie of a proper thickness ; but great care must be taken, in this method of proceeding, not to shake or move too forcibly the pieces of work thus covered with the powdered enamel.

It is usual to add oil of turpentine to the oils of spike or lavender, in order to make them go further, and save the expence attending the free use of them ; and others add also a little olive or linseed oil, or some, in the place of them, crude turpentine. The use of the spirit of turpentine is very allowable ; for it is the same for this purpose as the oils of spike or lavender ; except that it wants the glutinous quality which makes them serviceable in spreading the enamel : but with respect to the use of the oils of olive and linseed, or any other substantial oil, it is very detrimental tending to reduce the metalline calxes ; and leaving a small proportion of black coal or ashes, which
must

must necessarily injure the white colour of the ground.

When plates, as in the case of pictures, dial-plates, &c. are to be enameled, they should always be made convex on the outside, and concave within ; and all pieces of enamel formed of metal, where the figure does not admit of their being thick and solid, should be of the same kind of form : otherwise they will be very apt to warp in the heat ; and cannot be brought straight, after they are taken out of the fire, without cracking the enamel. For this reason, likewise, it is proper to enamel the work all over, as well on the wrong as right sides, to prevent the heat from calcining the metal ; which would both contribute to its warping, and weaken the texture of it.

The enamel being laid on the body to be enameled, when the fixt muffle is used, the piece must be gently lifted on to the false bottom ; and put in that state into the muffle fixt in the furnace described p. 235, by thrusting the false bottom into it as far as it will go. But it is best to defer this till the fire be perfectly in order, which must be known by putting a bit of tile or China with some enamel on it of the same tone with that used as a proof ; and another proof of the same kind may be also put along with the work into the muffle ; which, being taken out, may shew how the operation proceeds.

When coffins are used, the same general method is to be pursued : the pieces of work

to be enameled are to be laid on the bottom of the coffin till it be covered : and then the second flooring or false bottom is to be fixt in its place, and covered in the same manner ; after which the lid is to be put on ; and well secured, in the joints it forms with the sides of the coffin, by fire-lute. The proof, in this case, should be laid on the lid, on the part next the side door of the furnace ; and it may be expedient, especially till the working of the furnace, and the kind of enamel used be very well understood, to have two or three of these proofs. The enamel work being put thus into the coffins, they should be set on the dome of the furnace, which must be of the kind described p. 239, that they may be moderately heated, before they be put into the furnace ; which would otherwise endanger their cracking ; and when they are so heated, proof having been made, by means of a small bit of China, or copper covered with the enamel, that the fire be of a due force, they must be conveyed into the furnace through the side door, and must rest on the pieces of fire-stone placed for that purpose on the flooring in the back part of the furnace. It is requisite nevertheless, that the conveying them into the furnace should be managed with particular care to prevent the shaking off the enamel ; and it must be done by means of the peel or instrument adapted to this purpose ; on which the coffin being laid, it must be gently thrust into the furnace till the coffin be in its proper
X situation

situation, with respect to distance from the sides of the furnace; and then the further end of the peel must be turned slowly towards the front of the furnace; the coffin being at the same time shoved off from it by means of the flat end of the tongs before described, introduced through the door for feeding the fire, till it stand intirely on the fire-stones, when the peel must be withdrawn. The operation being finished, the peel must be again introduced under the coffin, by raising first the nearest end of it, by means of the tongs thro' the door in the front; and then the other parts gradually, till the peel support it; and then they must be drawn out together; and may be best placed on the dome of the furnace, that by cooling more gradually the temper of the enamel may be improved.

If it be required to burn a single piece or two in this kind of furnace, it may be done by means of the common or loose muffle described p. 241. In which case the enamel work being laid on the bottom or flooring of the muffle, and the muffle put over it, the whole must be conveyed into the furnace, by means of the tongs with turned points, thro' either of the doors; and a proof may be at the same time put in, on a piece of tile or spare bottom of a muffle: and the proceedings in other respects may be the same as with the fixt muffle, or the coffins.

Where there is no furnace, and it is desired to burn enamel work on an open hearth, preparation

paration must be made according to the directions in p. 240 : and the flooring of the muffle being laid at a proper distance from the nozzle of the bellows, the work must be laid on it ; and covered with the muffle : which being done, pieces of charcoal must be heaped over them ; and the fire being lighted, must be blown up with the bellows, till it be sufficient to flux the enamel ; which must be examined by the proof put into the fire along with the work. The coals must then be taken off from the muffle ; and the muffle, with the flooring and enameled work, removed out of the fire ; but kept near it to prevent their cooling too fast : and, if there be more work to be burnt, another muffle, &c. may be immediately put in the place of the other, and the same operation repeated ; for it is a matter of indifference, whether the coals be burning when the work is put on the hearth, or kindled afterwards.

Pit coal may be used in the furnace, where enamel is burnt with the fixt muffle, or in coffins : which is indeed one principal conveniency attending the use of them ; as it saves a considerable expence of charcoal : but where the open muffle is used, charcoal alone should be employed : as the fumes of mineral coal are very detrimental to some colours ; and destructive of the grounds, if whitened by arsenic, as the common white glass.

SECTION VIII.

Of the manner of laying on and burning the enamel colours.

THE colours being prepared, as above directed, and reduced to powder by due levigation, and washing over where they are required to be extremely fine and there is no unvitriified salt in the mixture, they must be tempered on a China or Dutch tile with oil of spike or lavender, to which most artists add likewise oil of turpentine; and some (but I think erroneously, as I have before mentioned) a little linseed or olive oil; and then used as paint of any other kind. But it should be avoided to mix more of the colours with the essential oils than will be immediately used; because they dry away extremely fast, and would not only be wasted, but give a cohesion to the particles of the colours, that would make them work less freely when again diluted with the oil.

The colours being thus laid on the pieces to be painted, the proceeding must be in all respects the same as with the grounds, in whatever manner they are to be burnt, either in the muffles or coffins; but greater nicety must be observed with respect to the fire; as the effects of any error in that point are of much greater consequence, in the burning the colours than grounds; especially if the white of the

grounds be formed from the calx of tin or antimony; and not arsenic.

Pit coal, as was above observed, may be employed for burning as well the colours as the grounds, where the muffle or coffins are used; or any other method pursued that wholly hinders the smoke and fumes from having any access to the enamel.

C H A P. X.

Of the method of painting on glass by burning, or with transparent colours that vitrify.

SECT. I. *Of the general nature of painting on glass with vitreous colours.*

THE art of painting on glass with colours that vitrify has been esteemed, as far as regards the composition and burning of the colours, a mystery known perfectly in the former ages; but lost in a great degree to the present times. It will appear, however, on due examination, that the case is far otherwise: that from default of artists who cultivate this manner of painting, which probably would not find many patrons at present, the dexterity or experience of making an advantageous use of

the colours so as to form good pictures is wanting; but that as to the knowledge of the preparation of the colours, and the method of burning them, we possess them from the modern improvements of chemistry, in a much more extensive degree than the former times: and that if any able painters were to apply themselves to this way of working, undoubtedly much better pictures would be now produced than those we so much value as remains of an art, of which we mistakenly suppose the methods of execution at present lost. For the sake, therefore, of those, who, from views either of profit or amusement, may chuse to apply themselves to the reviving this species of painting, I will give such lights into the nature of the subject, and the manner of pursuing it practically, as may enable any who can paint in oil, water, or other vehicles, soon to become masters of every thing peculiar to this art.

The painting with vitreous colours on glass depends intirely on the same principles, as painting in enamel; and the manner of executing it is likewise the same; except that in this the transparency of the colours being indispensibly requisite, no substances can be used to form them but such as vitrify perfectly; since without such vitrification, there can be no transparency. In other words, the whole mystery consists, in finding a set of colours, which are constituted or composed of such substances, by the admixture of other bodies, that may promote their vitrification and fusion, are capable

pable of being converted into glass; and melting, when in that state, with less heat than will melt such other kinds of glass as may be chosen for the ground or body to be painted; in tempering these colours, so as to make them proper to be worked with a pencil; and in burning, or reducing them by heat, to a due state of fusion without injuring or melting the glass which constitutes the body painted.

The circumstances of this art are so analogous to those of the art of enameling, that the same means will, as I have before intimated, serve for almost every particular purpose that occurs in the prosecution of it: and I have, therefore, but little occasion to enter into the detail, either of the preparation of the colours, or the use of them; as it will be sufficient to refer to what has been before said; and only to shew how the methods there taught are applicable to this intention.

SECTION II.

Of glass as a ground for painting with vitreous colours, or by burning.

THE first object to be regarded, is the choice of grounds; which should be plates, or vessels, of glass, that is of the first degree of hardness, but at the same time colour-

less, and without specks or wavings. The glass, which has these qualities in the greatest degree, is, the best of the kinds of that used for windows, except such as is made for looking-glasses, which though most colourless and clear, is softer from the quantity of borax and other fluxes which enter into its composition. This sort, which is called crown glass, being a glass of salts, is hard and transparent; and, being ready formed into plates, may consequently be had in a state proper for use; but where paintings of any consequence are undertaken, a composition, still better suited to this purpose, should be employed; and the glass wrought in the same manner as the looking-glass plates alone are at present.

When larger objects are to be depicted than the size of single plates of glass can contain, it is practised to join several squares together: which may be prepared for the painting in this manner. An even board, of the size of the whole of the plates laid together, should be sprinkled with a mixture of resin and pitch; which being melted by a flat iron held over it, the plates of glass should be placed on the board as close to each other as possible; and will be firmly fixed in, the situation they are laid, by the cement of resin and pitch as it cools. The glass being so fixt must be cleaned from any of the cement, which may have run through the joints, first by scraping, and after by rubbing with spirit of turpentine; and it will then be in a condition to be painted with the ground colours:

colours: which being performed, the plates may be taken off the board, by passing the flat iron heated over them at a proper distance; which melting the cement will let them loose from the board: and they may then be burnt separately without any inconvenience.

SECTION III.

Of the fluxes and colours to be used in painting on glass by burning.

THE same substances and manner of preparation of fluxes and colours, which serve for the purposes of enameling, will serve equally well for the purposes of painting on glass by burning; except, as was before observed, that all those bodies, which will not perfectly vitrify with such a force of flux and heat, as can be applied expediently with respect to the glass which forms the ground painted upon, must be wholly omitted.

I shall therefore wave any particular instructions, for the preparations of the fluxes and colours for this kind of painting, as needless repetition; and only enumerate the compositions before given, which are proper to be used in such instances, by referring to the following directions them, when

applied to this end, where any such is necessary.

The fluxes above given may be used as there prepared; and the same discretion must be exercised in adjusting the stronger or weaker to the ground, as in the case of enamel. But if the hardest of the two kinds of fluxes should be found too soft, in any instance of its application, it may be mixed with a due proportion (which must be found by trial) of the glass of the ground, levigated to perfect fineness.

To produce white in this kind of painting, the artifice of leaving the ground unpainted, or slightly obscured where a fouler tint is wanted, must be used, instead of an actual white body: unmodified light supplying the place of the reflected; and with the same effect in these circumstances as the reflected in the others.

The lighter tints of all the colours, such as rose or pink colour of crimson or scarlet,—carnation of orange,—straw colour of yellow,—and sky colour of blue, must be produced on the same principle as white, by laying on a less body of the colour; and consequently suffering it to be diluted by the light passing through the glass, instead of that reflected when bodies are mixt with the colours. The method of effecting this must, therefore, be either to spread the colours thinly on the ground; or, when the compositions given appear to have yet too great a body, to dilute the colour
by

by mixing with it an additional quantity of flux; or, if that render the mixture too soft, of levigated glass the same with the ground. In this manner, tints of all degrees of lightness may be produced with equal certainty and ease, as by the addition of white in enamel, and other kinds of painting; and with this further advantage, that, if the colours are wanting in brightness, they yet bear up and support their force much more than those equally foul would in the other method of use. I shall therefore omit any directions for the producing the diluted colours, (that is to say, those which in other kinds of painting are to be formed by the addition of white) as likewise all such others as are to be obtained by the compositions above exhibited in treating of enamel; and proceed only to enumerate them; subjoining only remarks on a case or two, where they are peculiarly material.

For a bright red take N° 2. which will be crimson or scarlet, according to the colour of the gold used:—for a fouler red, take N° 4. but it is extremely tender; and must not be run to perfect fusion, nor continued long in the fire:—when a very scarlet red is wanted, mix N° 2. with glass of antimony.

For a very bright blue, take N° 6. rendered perfectly transparent by fusion: but this being formed of ultramarine, which, when good, is of very high price, the use of it may in most cases be avoided by substituting the following compositions; as the effect which colours

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colours have in this way of painting, is so advantageous even to those that are fouler, as renders brightness of less consequence than in any other case:—for a full blue, which will not be wanting in brightness, but rather inclining to warmth, take N° 8.:—for a very cool blue, take N° 10. without the calx of antimony or tin:—for a truer blue than either of the last, mix them in the proportion that will produce the tint desired; but the blue of N° 10. verges more towards the green, than in proportion to the warmth of N° 8. when good.

For a very bright yellow, take N° 12. without the calx of antimony or tin, or N° 13.:—for a cheaper yellow, take N° 16.:—for a cheap warm yellow, take N° 17.

For a very bright green, take N° 16. prepared transparent, and N° 12. without antimony; and mix them in that proportion, which will render the green produced more inclining to the blue or yellow, according to the occasion; but this composition being expensive, on account of the ultramarine in N° 12. and extremely great brightness being seldom essential, as was before observed, in this kind of painting, the following may, in most cases, be substituted for it to advantage:—for a cheaper bright green, take N° 21. with the addition of a proper quantity of N° 16. if it be required to incline more to the yellow:—for a cheap but less bright green,
take

take N° 8. and N° 16. and mix them in the proportion to form the teint wanted.

For a bright orange colour, take N° 2. and N° 12. without antimony:—for a cheaper but more diluted orange, take glass of antimony, or a mixture of it with the foregoing:—for the diluted orange called *carnation*, take glass of antimony ten parts, the purple of N° 33. the zaffer being omitted in the preparation of it, one part; and mix them with the fluxes N° 1. or 2. according to the body of the colour desired.

For black, take N° 38. or 39.

For a red brown, take N° 35.:—for an olive brown, take N° 37.:—or fowl any of the reds or yellows before given, with a due proportion of black.

From the combinations of some of these, all the other variety of teints, both with respect to difference of hue or of lightness of colour, may be produced: and, if the manner of painting should ever make it necessary to diminish the transparency of any of them, it may be done by adding a small quantity of any of the compositions for white enamel, in that proportion which will produce the effect desired.

SECTION IV.

Of the manner of laying the colours on glass grounds, and burning them.

THE same affinity betwixt painting in enamel and on glass by burning, which renders the preparation of the colours so much the same in both, extends itself also to the manner of laying the colours on the grounds, and burning them.

The manner of tempering the colours and painting with them on glass, may therefore be exactly the same as was before directed for enamel; the oils of spike or lavender, and of turpentine, being alike suitable in this case as in the other: but with respect to the manner of burning the colours, though the general methods must be the same, yet a variation in certain particulars is in some cases necessary: which I shall therefore take notice of here.

Smaller plates, or other figured bodies of glass, may have the colours burnt in the *fixt* or loose muffles; but larger plates require *coffins*, which may be formed in the same manner as was directed for enamel, though, as the form of the plates in this case are flat, and not convex, as is necessary in the other, a number of layers or strata may be put into the same coffin: for it is not material how near the surfaces of the plates are to each other, provided they

they do not touch. The best method of placing them to advantage in the coffins, is to have iron plates adapted to the coffins; which iron plates should have at every corner a small bit of iron going off at right angles, that the plates being put over each other may be supported by these bits of irons as short pillars; and kept at such distance from each other, as will suffer the glass to lye betwixt them clear of all contact with any other body, as far as regards their upper surface: the bottom plate, nevertheless, must have no pillars; as there will be nothing under it, but the substance of the coffin. These iron plates must be made so much bigger than the plates of glass; that the latter may lye upon them clear of the pillars, which should rest on the iron plates under them, and not on the glass. The iron plates being, in this manner, adapted to the coffins, the bottom must be put into it, and one of the plates of glass laid upon that; but at such an exact distance from each side, that the pillars of the next iron plate may not rest upon it, but on the bare part of the iron plate under it; another plate of glass must be then laid in the same manner on this plate of iron; and the same proceeding continued till the coffin be filled: and then the lid must be luted on; and the same method observed in all other particulars as was before directed for the burning enamel paintings. As there may be occasion, however, to use larger coffins for painted glass than enamel, the dimensions of
the

the furnace must, when such are wanted, be varied accordingly: but it will not be necessary to enlarge the area of that part of the furnace, which contains the fuel in depth; for if it be increased in length, from side to side, in proportion to the increased magnitude of the coffins, it will sufficiently augment the body of fire.

C H A P. XI.

Of gilding enamel and glass by burning.

THERE are two methods of gilding enamel and glass, by burning or annealing: the one is the producing a cohesion of the gold with the glass or enamel, by the intermediation of a flux; the other without any: but the principle is the same, nevertheless, in both; and is in fact no other, than the causing the gold to adhere to the enamel or glass in consequence of the fusion or approach to that state, either of the flux used, or the body of enamel or glass itself; by which the gold is cemented to such body.

The flux, when any is used, may be either simple glass of borax, or any of the above directed preparations of fluxes powdered.

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There are other differences likewise in the manner of this gilding, which respect the state of the gold: for it may be either used in the form of leaf gold, or in that of powder.

When leaf gold is employed for gilding enamel or glass, in this way, without any flux, the enamel or glass may be moistened with a very weak solution of gum Arabic, and again dried. Being so prepared, it should be breathed upon, till it become a little adhesive or sticky; and then it should be laid upon a leaf of gold; and if that be not sufficient to cover it, the remaining part must be laid on others, and the work afresh breathed upon if it appear dry before the whole surface be gilded. When the gold is thus united to the enamel or glass, by the cementing quality of the gum Arabic, which is used in order to keep it close and even to the body to be gilded, the work is ready for burning.

If the leaf gold be used for gilding enamel or glass with the aid of any flux, such flux, being finely levigated, should be tempered with a very weak solution of gum Arabic, and very thinly spread on the part of the work to be gilded; and when the gum water is near dry, the leaf gold should be laid on the part thus prepared for it; or if the work be kept beyond the time, it must be breathed upon, till it become sticky: the gold thus fixed on the work, it is in a state proper for burning.

The advantage in omitting to use any flux, is the rendering the gold less prominent, and uneven, with respect to the body gilded; which is in some cases material; but unless the ground, whether of enamel or glass, be very soft, it requires a strong heat to make the gold take hold of it; and this, in the case of enamel, endangers the ground, or any painting upon it: for, if the degree of heat be not very nicely adjusted, the glass or enamel will run into too liquid a state in some instances, and in others not be softened sufficiently to cohere with the gold. The advantage of using a flux, lies in avoiding both these inconveniences; and, particularly in the case of very hard glass, the being certain that the gold will take; which is, without this medium, sometimes dubious: but the flux lying under the gold prevents it necessarily from being so level with the surface; or having the same evenness as when laid on the body itself without any intermedium.

Before we speak of the method of using the gold in powder for gilding in this way, it is proper to mention the manner of preparing this powder; which may be best made in the following manner.

“ Take any quantity of gold, and dissolve
 “ it in aqua regia, according to the directions
 “ given in p. 255, in the process for making
 “ the calx cassii, or gold purple. When it
 “ is dissolved, make a precipitation of the gold
 “ by putting into the solution slips of copper
 “ plate;

“ plate; which must be continued there till
 “ they no longer produce any effervescence
 “ in the fluid. These slips of copper being
 “ then taken out, and the gold adhering to
 “ them gently beaten off, the fluid must be
 “ poured off from the precipitate, and fresh
 “ water put in its place; which must be re-
 “ newed, in like manner, several times, till
 “ the salt formed by the copper and aqua re-
 “ gia, be intirely washed from the gold;
 “ which, being dried, will be ready for use.”

Where it will not answer the trouble to
 prepare this powder, that formed of leaf gold,
 in the manner below taught, may be used in
 its place: but this precipitate is a more im-
 palpable powder than can be obtained by any
 different method; and will take a finer bur-
 nish than any other kind when employed in
 this sort of gilding.

The manner of using this precipitate of gold
 in gilding of glass or enamel, may be varied
 two ways, as well as that of the leaf gold;
 viz. by adding to it or omitting any flux.
 The convenience of using flux is the same
 with that before mentioned, with the further
 advantage of rendering the gilding extremely
 durable, even to degree of bearing to be scraped:
 but the disadvantages are greater; for not lying
 under the gold as in the other case, but being
 mixt with it, the flux destroys the rich me-
 talline look; and what is still much worse,
 in many cases prevents its taking a burnish
 with the true lustre.

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In which way soever the powder is used, it is to be tempered with the oil of spike, and worked as the enamel colours: and the quantity of flux may be a third of the weight of the gold. When the gold is thus laid on, the work is ready for burning; which operation must be performed in the same manner, excepting what regards the degree of heat, in all the different methods of gilding that have been here mentioned.

The manner of proceeding for burning or annealing the work in this kind of gilding, is the same with the treatment of the enamel or glass in the use of the colours: except that the pieces may either be put into the muffles, or coffins: or, in the case of the glass, if there be no painting, the operation may be performed in the naked fire.

After the work is burnt, if it be designed to be burnished, a proper lustre may be given to it by rubbing the gilded part with a dog's tooth, or with a fine agate, or iron, burnishers.

C H A P.

C H A P. XII.

Of the taking of mezzotinto prints on glass, and painting upon them with oil, or varnish colours.

THE painting on glass, by means of mezzotinto prints, is performed by cementing the printed side of the prints to the surface of the glass, by the assistance of some glutinous body which will not dissolve in water; and then destroying the texture of the paper by water, so that it may be rubbed intirely off from the cement upon the glass; leaving, at the same time, the whole of the ink of the print upon the cement, and glass, in the same manner as if the original impression had been made there; by which method, a complete drawing of the picture designed is obtained on the glass; and may be coloured by the use of oil, varnish, or water colours.

The method of performing this is as follows.

Procure a piece of the best crown glass as near as possible in size to the print to be taken off; and varnish it thinly over with turpentine, rendered a little more fluid by the addition of oil of turpentine. Lay the print then on the glass beginning at one end; and pressing it gently down in every part in proceeding to the other: to prevent any vesicles of air being formed, in the laying it on, by the paper touching

ing the cement unequally in different parts; and to settle the whole more closely to the glass, it is well to pass over a wooden roller over it; which roller may be made of any kind of wood turned, and may be about two inches in diameter. Dry the glass, with the print thus laid upon it, at the fire, till the turpentine be perfectly hard; and afterwards moisten the paper well with water, till it be thoroughly soaked. Then rub off the paper intirely from the cement, by gently rolling it under the finger; and let it dry without any heat: the impressiion of the print will be found perfect on the glass; and may be painted over with either oil or varnish colours.

The choice and treatment of the colours for painting in this way upon glass, in either oil or varnish, may be the same as for any other method; and it is therefore needless to enumerate any further particulars, but to refer to the parts of this work where the nature and preparation of them, as well as the manner of composition of them, with the oils and varnish, is before explained.

C H A P. XIII.

Of colouring or washing maps, prints,
&c.

THE colouring maps, or other prints, is performed, either by spreading opake colours so thinly on the subject, that the full effect of the printing may appear under them; or by using transparent colours, which stain the ground and dry away without leaving any opake body: this last method is called *washing*.

The using opake colours, or such as have a solid body, in this way on prints, depends intirely on the kind of vehicle used. For if the colour be suspended by the vehicle, that it can be spread so as to lie in the most sparfed, and yet equal manner, it may be applied to this purpose with success: and such as are very strong and bright, even though of the most opake body, as vermilion, verditer, ultramarine, or turpeth mineral, will answer the end. The best method of doing this is the using the isinglass size, as I before intimated, prepared with sugar or honey, according to the directions given in p. 168: which makes the colours of this sort work so freely, that they may be diffused almost as easily as the transparent kinds; and with nearly as good effect. The proportion of the strength of the size to each particular sort is likewise beforementioned in

p. 173, and it is therefore unnecessary to give it here: but it is proper in most cases to dilute the composition more for the washing maps, and spreading the colour over large surfaces, than when employed in painting.

Besides the opaque, there are a number of colours, which are semi-transparent, and yet have a body in a greater or less degree; these are carmine, bistre, and gall-stone in the first degree, with lake and Prussian blue in the second; all which may be treated in the same manner, but require very different proportion in the strength of the size; for the first of these classes ought to have as little as possible of the size; and the latter to be more copiously furnished with it.

The transparent colours should be preferred for this purpose to either of the other kinds; as their effect is better, and they require no preparation. These colours are, *for red*, red ink;—*for blue*, litmus;—*for green*, sap green, and verdigrise (in vinegar);—*for yellow*, gamboge, the yellow berry wash and turmeric wash;—*for purple*, the logwood wash and archal;—*for brown*, Spanish liquorice;—and *for black*, Indian ink. These require only to be dissolved in water; which should be more copiously added where they are employed for washing prints or colouring large grounds of any kind.

With respect to the manner of using any of these classes in the colouring maps and prints, there is nothing more required, than in any other
other

other painting; except that it must be carefully observed in employing the opaque or semi-transparent colours, never to cover any parts so strongly with them, as to prevent the distinct appearance of the shades of the printed design; as they are to shew themselves through the colours; and form the shades of the picture made by the colouring.

In the illuminating (as it is called) maps, as little peculiar in the manner is necessary as in the case of other prints: only, the intent of colouring them being to distinguish the divisions of the maps with respect to countries, districts, &c. care must be taken not to lay the fluid colours on so copiously as to flow beyond the limits of what they are intended to cover: and the rest depends on the disposing of the variety of colours so in different parts as to give them a strong and pleasing effect; which must depend more on fancy and good taste than on any rules. There is indeed one thing in particular, which it may be proper to remark, should be always avoided: it is, the laying those colours, that have any affinity or likeness, close to each other: for by an error in this particular, they will be rendered much less effectual with respect to the purpose they are to serve; as it is by such a disposition made more difficult to the eye, to distinguish the limits and bounds they are intended to mark out: and indeed, besides, for want of due apposition, the diversification of the colours is made less pleasing, when they are seen at a distance,

distance, and considered only with respect to their ornamental appearance. There is one other rule, I will likewise recommend the observance of, though many think they are giving most perfection to their work when they most deviate from it; it is, the never using too strong and deep colours for this purpose; as they render the legible characters of the maps less distinct and perceptible; such a practice is therefore repugnant in a certain degree to the principal intention of the maps; and moreover gives them a tawdry glaring appearance which is very inconsistent with good taste; one great principle of which is simplicity, and thereby avoiding a false and unmeaning showiness.

PART II.

Of the several arts used in making outline sketches of designs from nature, or depicted representations : and of the means of taking casts and impressions, from figures, busts, medals, leaves, &c.

CHAP. I.

Of the devices employed for the more easily obtaining a just outline in making designs from nature ; and the various methods of off-tracing, calking, and reducing, pictures, prints, or drawings.

AS the drawing accurately and readily after nature, and depicted representations, by the unassisted hand and eye, requires greater practice and command of pencil than fall to the share of many, who nevertheless may not want abilities to colour or shade a picture or drawing when a proper outline sketch is previously procured, and as the
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convenience of quicker dispatch is a matter of importance even to those who are most expert, various means have been devised to lead and direct the eye or hand in forming just outlines of the principal objects which compose the design. These means consist of a multiplicity of methods, founded on different principles.

In the drawing after nature, the interposing a transparent plane is commonly practised ; through which the objects being seen from a fixt point of view, the outlines of their parts are traced upon it, by chalk or some kind of crayon ;—or such transparent body is divided into squares, through which the objects being viewed, the eye may be enabled to form and dispose them with more certainty, on a paper, or other proper ground, divided into a similar number of squares ;—or some reflected image is obtained by means of a camera obscura, which affords an opportunity both of drawing the figure, and imitating the natural colour of the objects. These are the devices employed for drawing after nature: but, where pictures, prints, or drawings are to be copied, a much greater variety are used. The most common is by *off-tracing*, as it is called, which is the laying some transparent substance over the picture, print, or drawing ; and passing over the outlines of the principal parts with a pencil or crayon, which delineation is to be afterwards transferred from this transparent body to the ground intended for the painting
or

or drawing. The second, which is indeed only another kind of off-tracing, practised sometimes in the case of prints and drawings, is effected by laying the originals on the ground of paper or vellum designed for the copy; the back of the original being smeared with black, or with vermilion mixt with a little butter; or a paper so prepared being laid betwixt the original and copy; and tracing over the principal parts of the design with a needle, or some other such like instrument; by which means an outline sketch of it will be formed on the ground of the copy. This method is called *calking*; and is performed also in another way, by puncturing or pricking the original print or drawing; and producing an outline on a new ground, by transmitting a coloured powder through the punctured holes. The third is by dissolving part of the printing ink by means of sope; and impressing it on a fresh ground in that state. Another method much practised is the using squares in the manner above spoken of, in the expedients for drawing after nature; except that here they are to be laid upon the picture: and this method is, likewise, applied, to the more certain copying of pictures or drawings, where the new design is to differ in magnitude from the original; in which case it is called *reduction*: for the answering which purpose there is likewise another method, by means of a machine I shall below describe,

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describe, for off-tracing in a manner, where, by simply drawing over the lines of the original, the new sketch may be made greater or less at pleasure.

The particular manner of using the transparent plane for taking designs from nature is, by framing a piece of tiffany or fine lawn, of the size of the picture or drawing intended; and fixing it so that the whole view of what is to be painted may be seen through it; a sight board; that is, a flat piece of wood, with a hole in it, being placed parallel to the tiffany or lawn, in such manner, that the eye may command the whole view through it, at the same time that the hand may reach with convenience to draw upon it. The outlines of the object, as they appear through the hole in the sight board, must then be traced out, on the tiffany or lawn, by a crayon formed of white or red chalk, charcoal, or any proper substance; by which means, a sketch of the design will be produced. In order to form a more complete drawing from this crude sketch, on paper or vellum, the tiffany or lawn containing it must be carefully laid on such paper or vellum, in an horizontal position; and, being well fixed down upon it, must be struck with some flat body in every part; by which means, the chalk or matter of the crayon will be transferred from the old to the new ground; and produce the same delineation of the object upon it as was before on the other. The impression, thus made on the new ground, should be then over-traced.

traced with a black lead pencil ; and afterwards corrected, if there be occasion, from the natural view through the sight board ; and this paper or vellum will then contain a proper outline drawing, if the design was intended for a painting in water colours. But when this method is pursued with a view to a painting in oil, the tiffany or lawn, after the sketch is drawn, must be laid upon the ground of the intended picture ; and proceeded with in the same manner as with the vellum, or paper ; only, in this case, the over-tracing must be made with some kind of crayon instead of the black lead pencil.

It is advised by some to use paper made transparent by means of oil of turpentine, instead of the tiffany and lawn : but the use of it is only practicable in this way, in a darkened room or other confined place ; and the paper thus prepared does not become transparent enough, even then, to shew minute or remote objects so distinctly as is necessary. If, however, any chuse to use it, the usual preparation of the paper is, only to brush it several times over with the oil of turpentine, and to suffer it to dry. The transparency will be much improved, if a third of nut or poppy oil be added to the oil of turpentine ; or otherwise a little crude turpentine or colourless varnish : any of which will render the oil of turpentine more efficacious for this purpose : and save the trouble and expence of rubbing the paper so often over as is otherwise
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necessary. The paper employed for this purpose should be that called *fan-paper*; which is to be had of the fan-makers: or, if that cannot be procured, fine post paper may be substituted: and where the design is too large to be contained in one sheet, several may be joined together, by laying the edges of the sheets a very little over each other; and cementing them by isinglass glue; which, if neatly done, will effect the transparency in the joints, but in a very minute degree. When the original sketch is made on transparent paper, the tracing or drawing may be performed by a black lead pencil, instead of crayon, which renders the drawing much more perfect and durable: and, being thus completed, it may be used for off-tracing the sketch on any ground intended for a painting in either oil or water. If it be intended for a picture in oil colours, the back of the paper may be smeared with pounded black lead, charcoal dust, or any other powdered crayon; or, what is much better, vermilion mixed with just so much butter as will make it adhere to the paper: and it must then be laid on the ground of the picture, and overtraced by a copper or iron stiff, or blunted needle; which will make an impression of the sketch, on the ground, by means of the colour on the back of the paper: or another paper may be coloured, with the black lead or vermilion, instead of the back of the transparent paper; and being betwixt that and the ground will answer the same end. The means are no way different,

where the sketch is to be transmitted to paper instead of oil; but in colouring the back of the transparent paper, or that interposed where any such is used, care should be taken that the colour be so wiped off, as not to smear the ground, or produce any effect, except where compressed by the instrument in the overtracing: and this indeed should be regarded to a certain degree even with the oil ground. Where the sketch is large, and made on several sheets of paper, it is convenient to have weights to place on the four corners of the conjoined sheets to keep them even and steady on the ground. They are best formed of square pieces of lead with handles; and may be about two or three pounds weight each.

The sketch on transparent paper may be otherwise transmitted to any ground by puncturing it with holes made near each other in the lines of the drawing, and then fixing it on the ground, and dusting over it black lead or any other coloured matter finely powdered; and tied up in a fine linnen cloth: which dust passing the holes of the pickt paper will delineate the sketch on the new ground, so that it may then be overtraced by any kind of pencil or crayon. Glass has been also used in the same view, as the lawn or transparent paper: but its texture hinders it from being well managed with chalk or any other crayon or pencil. Though there is a method, that has not, as far as I know of, been hitherto practised, by which a sketch might be well obtained through its use:

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it is, by drawing the outlines of the objects with black colour in drying oil ; and when the sketch is finished, laying the paper intended to receive the copy gently and without any rubbing or shifting on the glass ; having first moistned it with water : by which means the black paint will be transmitted to the paper, as the moisture exhales from it ; and an impression made sufficiently exact for the purpose.

The manner of assisting the eye, in designing from nature by means of a plane divided into squares, is, by drawing cross lines parallel to each other on a tiffany or lawn framed ; or on transparent paper, or glass ; which may be done with common writing ink or any other way that will render the lines visible ; and this, being placed before the sight board in the same manner as was before directed for tracing the outlines, the ground, on which the sketch is intended to be taken, must be formed into an equal number of squares ; and the objects, being seen through the squares of the transparent plane, are much more easily disposed in their proper situation ; and formed of a just magnitude by placing them in the correspondent square of the ground, than where the eye had no such medium to compare and judge by. But though the above substances are most commonly used, there is a more simple and effectual way of doing this, which is, by making a frame of a proper size ; and dividing the area it forms into squares by threads of a moderate thickness ;

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thickness; in which way the objects to be drawn are consequently more within the power of the eye than when the most transparent body is used. The drawing by the assistance of squares, to those who have the least command of hand, is by much the most expedient way: but in order to render this, or the other methods more commodiously practicable, where it is to be done in the open air, a portable machine should be made for supporting the frame of the transparent plane, and the sight board. It may be constructed by joining three long legs together, in the manner of the surveyors instruments, in a block; and fixing the frame, by means of a foot which will slide, into the same box, that it may be raised higher or lower: the sight board must have a foot likewise by which it may be raised higher or lower; but this must not be fixed into the block, but into a sliding piece which must pass thro' the block horizontally; so that the foot of the sight board, being fixt into it at right angles, the board may be brought nearer to, or drawn farther from the transparent plane at pleasure.

The other method used to facilitate the drawing after nature, to wit, by the reflected image of the object, is performed by the camera obscura, of which a portable kind adapted to this purpose is commonly made by the opticians. It is needless, therefore, to give any description of these instruments; and the structure of them immediately explains the manner of their use.

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on a very slight examination. Where they are not at hand, and a prospect through any particular window is desired to be taken, an occasional camera may be formed, by boring a hole through the window-shutter at a convenient height; and putting one of the glasses called the ox-eye, into the hole; when all other light being shut out, except what passes thro' this hole, and a proper ground of paper or vellum, &c. being held at a due distance from the hole, the reflected image of the prospect will be formed upon the ground: and if it be of paper, and fixed steady by a proper frame, the image appearing very perfectly on the reverse or backside, of it, the artist may stand at the back; and trace the outlines of the necessary parts with great convenience; and may even stretch the colouring, if he think it expedient. Though the taking views of nature by the camera has several conveniences, and appears very advantageous; yet there is one very material objection, which is, that the shadows lose their force in the reflected image; and objects, by the refraction, are made to appear rounder, or different sometimes both in their magnitude, and site, from what they really are: which being oppugnant to the truth of any drawing, almost wholly destroys the expedience there would be otherwise found in this manner.

The method of making sketches of outlines from pictures, prints, or drawing, by off-tracing, is performed by a variety of methods.

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The most common, where the size of the painting does not forbid it, is to take a sheet of paper prepared by oil of turpentine, or the other means, as above directed for the taking views from nature; and, having fastened it even on the picture or print to be copied, to trace over the principal parts with a black lead pencil: by which means an outline being obtained, it may be imparted to any other ground, in the manner before described when the same kind of outline is formed by drawing after nature. Where larger pieces are to be copied, lawn, and tiffany, may be used, instead of the transparent paper, or several sheets of the paper may be joined together by means of isinglass glue; and when the outline is traced by chalk or other proper crayon, the subsequent proceeding may be the like also, in this case, as above, where the same kind of outline is taken from nature. Goldbeaters-skin, and horn as prepared in plates for lanthorns, as also the talc or fossile isinglass, and dried hogs bladder, have been likewise applied to this purpose; but where horn, or isinglass, are used, being rigid bodies that will not yield to impart an impression by re-tracing, they may be best treated in the manner above advised, in the case of glass; when employed for taking views from nature; which is by tracing the outlines with black in oil, and printing a new ground of paper with it.

Another common method of off-tracing, in the case of prints, or drawings, is to fix them

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against a window, or other hard transparent body placed in a strong light, in a perpendicular position ; and, putting a piece of paper, vellum, or any other body sufficiently transparent before them, to perform the off-tracing, by the view which is this way given of the objects in the print or drawing.

The other method of off-tracing called *calking*, which is sometimes practised in the case of prints and drawings, is performed by tracing on the print or drawing itself, instead of the transparent body laid over it, as in the other manner ; the back of it being previously prepared by rubbing it over with black lead powdered, or other such matter ; or a paper blacked on the under side may be used, instead of blacking the print or drawing : by either of which methods an outline will be made on any ground of vellum or paper laid under the print ; and if several grounds of very thin paper be laid together under the print, with each a blackened paper over them, so many impressions may be made at one time. The same effect may be produced by puncturing or pricking out the proper outlines in the print or drawing ; and then using it for imparting the sketch to another ground, with the black lead powder, &c. in the manner above described in speaking of the use of the oiled paper : and when the print or drawing is thus prepared by puncturing, it may be employed for transmitting the sketch to any number of grounds.

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The manner of using sope, for taking off the impression of a print on a new ground, is, by smearing the original over with the common soft sope, commixt with water till it be of the consistence of a thin jelly; and then laying it even on the ground intended to receive the impression, which must be also previously moistened with water: after which, being covered with several other papers, the whole must be compressed by passing a wooden roller over them; or by rubbing strongly on them with the callender glass used for glazing linnen; or by any parallel means. The impression of the original will by this means be imparted to the new ground; which must be first dried, and then carefully washed with a sponge and water to take off the sope. It has been said by some, that this treatment will do very little injury to the original print; but, besides the impracticability of ever thoroughly cleansing it from the sope, a part of the printing ink is taken from it, and a proportionable share of the effect of the original impression destroyed.

A method parallel to this is sometimes used with prints and drawings; which is by holding them up to the light, and tracing the proper outlines on the back with a black lead pencil, or any kind of crayon; and then laying the traced side on a ground proper to receive the impression, going over them with a roller or callender glass, in the same manner as when the impression is taken by means of sope. On

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the same principle, in the case of compartments, cyphers, or any other regular figures, where both sides are alike, when one half is drawn or traced, the other half may be procured by doubling the paper exactly in the place where the two halves should join; and then pressing or rolling over the outside of the sketched part, by which a correspondent impression of the design will be made on the other: and the whole sketch will be finished without the trouble of drawing or tracing out the second half.

The method of copying designs, by the use of the squares, either in order to paint in equal magnitude, or with a view to reduction, is, by dividing the original into a convenient number of squares, by ruling lines across it with any kind of crayon; and then doing the same on the ground, in a correspondent manner; which squares on the new ground, may be either increased, diminished, or made equal as to their size, with respect to those of the original, according to the intended proportion of the new piece. The principal use of the squares, in this case, is so much the same, as when they are applied to the taking drawings from nature, that it is needless to dwell longer on them now. I shall only intimate, that, to those who can draw at all, the use of the squares is much more advisable here, as well as in drawing after nature, than any of the other methods: as it is much more improving, and on the whole less troublesome, to make a correct sketch this way than by any other.

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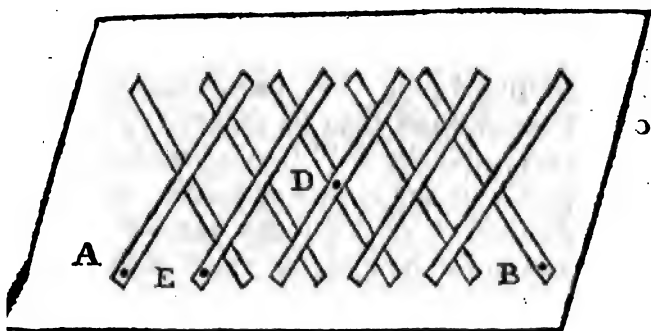
The manner of reduction, or if that be not necessary, of tracing out an outline where the magnitude of the original is to be preserved, by the machine above mentioned, which was formerly called a *parallelogram*, and by some at present a *mathematical compass*, cannot be shewn, without first describing fully, or exhibiting by a figure, the construction of the instrument. I shall therefore endeavour to explain the structure and manner of fabrication of it, as well as those of a machine somewhat complex admit: and what may escape the conception in the verbal description, may be supplied by the inspection of the figure annexed.

This instrument is composed of a board, or table, with ten pieces of wood fixed upon it, in a moveable manner; and by such a construction, that when one is moved, the whole of the rest move also similarly, with respect to the directions, but under greater or less angles. The board or table may be of fir deal; and is usually made in the form of a parallelogram; the magnitude of it, as well as the other parts of the machine, must be according to that of the pictures, &c. it is intended to be used for reducing: but for the sake of giving the comparative proportions, we will state it at three feet in length, and the breadth may be about a foot and a half: it must be plained very even; but should not be of too thin substance, lest it warp; and it must be covered with cloth stretched even upon it, and fastened down to it. The ten pieces of wood must
be

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be formed like rulers used for writing; and in the proportion here taken, they may be a foot long, and about half an inch in breadth; and the fifth or sixth of an inch in thickness. They must be fastened to each other in such manner, that every one must be crossed by another in the centre; and by two others, at such distance from the centre, as exactly divides the two half lengths on each side of it; except the two which form the extremities, and can be only crossed in the centre and in the middle of one part; which, in each extremity, will be the part opposite to that so crossed in the other, as will immediately appear on the pieces being laid together in the position here directed. The fastening must be by pins, or rivets, on which each piece may be turned with perfect freedom; and, near each end of every piece, must be made a hole or a female screw, into which a crayon, portcrayon, or pencil, may be fixed, either by, or without, a screw; and at the ends of those pieces which make the extremities, a smaller hole for a pin to be passed through to fasten the conjoined pieces to the board. In order to the more commodiously fixing the several parts of the instrument to the board or table, it may be proper to have female screws at the places of the table where the rulers are to be pinned down according to the different applications of the instrument; and the pins for fastening the respective parts, must in
this

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 this case have male screws at their extremities,
 correspondent to the female screws in the
 table. By these directions closely followed,
 the parts of the instrument may be completely
 formed, and put together : but to explain the
 manner of using it, the figure is here given ;
 as it is more easy to refer to the parts of that,
 than to such as have only a verbal specifica-
 tion.



Let the leg or extremity of the piece *A* be
 fastened to the board in the part of it as here
 delineated ; and let the picture, &c. be placed
 under the end of the piece *B* ; a strong pin
 blunted, or other such rigid body, being
 put through the end of it, and placed in the
 centre of the picture ; or any other part where
 it may be convenient to begin the tracing.
 Let the ground intended to receive the draw-
 ing,

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ing, or sketch, be then placed at *E*, the next leg to that fastened to the board, if the design of the original be intended to be diminished, in the utmost degree the machine can effect; or to any of the other legs nearer to the original, according to the proportion of the diminution required. A crayon, or pencil, must then be fixed in the hole of the piece *E*, made for that purpose; and must rest on the ground of the sketch; which ground must be so placed, that the crayon or pencil may be immediately over the part of it which corresponds with the part of the original touched by the blunted pin. The picture and ground of the sketch must then be fastened firmly to the board; and the artist bearing with his left hand gently on the crayon or pencil, over the ground, must trace with the blunted pin or stiff fixed in the hole of the most distant leg of the outlines of the original: which will so move the crayon or pencil on the ground for the sketch, that a correspondent line will be marked there; but with a diminution of the design in the proportion desired.

When the enlargement of the original is desired, the reverse must be practised with regard to the situation of the original and copy: for if the original be placed under *E*, the piece next to that fastened to the board, and the new ground be put under *B*, the end of the leg where the original was before placed, the subsequent management being the same as before in all other respects, the sketch will be

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be augmented in an equal degree to what it was diminished before.

If a sketch of equal magnitude be desired, the fastening of the conjoined pieces to the table or board must be at *D*, in the centre of the whole : and the original, and new ground, placed under the pieces at each extremity, or any other correspondent pieces that may be most commodious.

This machine may be useful for off-tracing maps, or other such simpler designs ; or may afford amusement by off-tracing pictures, &c. to those who have no facility in drawing ; but to the abler, and more expert in these arts, where designs that demand spirit and pencil are in question, it seems an expedient below their regard ; as performing by an imperfect mechanical aid, what they can execute better by their own natural powers.

C H A P. II.

Of the means of taking casts, and impressions, from figures, busts, medals, leaves, &c.

THE method of taking casts of figures and busts, as at present practised, is most generally by the use of plaster of Paris ; or, in other words, alabaster calcined by a gentle heat.

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heat. The advantage of using this substance preferably to others, consists in this, that notwithstanding a slight calcination reduces it to a pulverine state, it becomes again a tenacious and cohering body, by being moistened with water; and afterwards suffered to dry; by which means either a concave or convex figure may be given by a proper mold or model to it when wet, and retained by the hardness it acquires when dry: and from these qualities, it is fitted to the double use of making both casts, and molds for forming those casts. The plaster is to be had ready prepared of those, who make it their business to sell it, and the only care is to see that it is genuine.

The particular manner of making casts depends on the form of the subject to be taken. Where there are no projecting parts, it is very simple and easy; as likewise where there are as such form only a right or any greater angle with the principal surface of the body: but where parts project in lesser angles, or form curves inclined towards the principal surface of the body, the work is more difficult. I shall therefore first explain those particulars of the manner, which are general to all kinds; and then point out the extraordinary methods to be used where difficulties occur.

The first step to be taken is, the forming the mold; which is, indeed, done by much the same means, as the cast is afterwards made in it. In order to this, if the original or model be a bas-relief, or any other piece of a flat form,

form, having its surface first well greased, it must be placed on a proper table, or other such support; and surrounded by a frame, the sides of which must be at such a distance from it, as will allow a proper thickness for the sides of the mold. A due quantity of the plaster, that is, what will be sufficient to cover and rise to such a thickness as may give sufficient strength to the mold, as also to fill the hollow betwixt the frame and the model, must be moistened with water, till it be just of such consistence as will allow it to be poured upon the model; which should be done as soon as possible: for it must not be delayed after the water is added to the plaster, which would otherwise concrete or set, so as to become more troublesome in the working, or unfit to be used. The whole must then be suffered to remain in this condition, till the plaster has attained its hardness; and then the frame being taken away, the preparatory cast or mold thus formed may be taken off from the subject intire.

Where the model or original subject is of a round or erect form, a different method must be pursued; and the mold must be divided into several pieces: or if the subject consists of detached and projecting parts, it is frequently most expedient to cast such parts separately; and afterwards join them together.

Where the original subject or model forms a round, or spheroid, or any part of such round, or spheroid, more than one half, the
plaster

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plaster must be used without any frame to keep it round the model; and must be tempered, with water, to such a consistence, that it may be wrought with the hand like very soft paste: but though it must not be so fluid, as when prepared for flat figured models, it must yet be as moist as if compatible with its cohering sufficiently to hold together: and being thus prepared, it must be put upon the model, and compressed with the hand, or any flat instrument, that the parts of it may adapt themselves, in the most perfect manner, to those of the subject, as well as be compact with respect to themselves. When the model is so covered to a convenient thickness, the whole must be left at rest till the plaster be set and firm, so as to bear dividing without falling to pieces; or being liable to be put out of its form by slight violence: and it must then be divided into pieces, in order to its being taken off from the model, by cutting it with a knife, or with a very thin blade; and being divided, must be cautiously taken off, and kept till dry: but it must be always carefully observed, before the separation of the parts be made, to notch them cross the joints, or lines of the division, at proper distances, that they may with ease and certainty be properly conjoined again; which would be much more precarious and troublesome without such directive marks. The art of properly dividing the molds, in order to make them separate from the model, constitutes the greatest object

ject of dexterity and skill in the art of casting; and does not admit of rules for the most advantageous conduct of it in every case: but I shall endeavour to explain the principles on which it depends in such manner, that by a due application of them, all difficulties may at any time be surmounted, and an expertness even of manner acquired by a little practice. With respect to the case in question, where the subject is of a round or spheroidal form, it is best to divide the mold into three parts, which will then easily come off from the model: and the same hold good of a cylinder, or any regular curve figure.

The mold being thus formed and dry, and the parts put together, it must be first greased and placed in such a position that the hollow may lie upwards, and then filled with plaster commixt with water, in the same proportion and manner as was directed for the casting the mold: and when the cast is perfectly set, and dry, it must be taken out of the mold and repaired, where it is necessary: which finishes the whole operation.

This is all that is required with respect to subjects, where the surfaces have the regularity above mentioned: but where they form curves which intersect each other, the conduct of the operation must be varied with respect to the manner of taking the cast of the mold from off the subject or model; and where there are long projecting parts, such as legs or arms, they should, as was observed before, be wrought in separate casts.

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The method of dividing properly the molds cannot be reduced, as I intimated, to any particular rules; but must depend in some degree on the skill of the operator, who may easily judge from the original subjects, by the means here suggested, what parts will come off together; and what require to be separated: the principle of the whole consists only in this, that where *under-workings*, as they are called, occur, that is, where-ever a streight line drawn from the basis or insertion of any projection, would be cut or crossed by any part of such projection, such part cannot be taken off without a division: which must be made either in the place where the projection would cross the streight line; or, as that is frequently difficult, the whole projection must be separated from the main body and divided also length ways into two parts: and where there are no projections from the principal surfaces, but the body is so formed as to render the surface a composition of such curves, that a streight line being drawn parallel to the surface of one part would be cut by the outline, in one or more places, of another part, a division of the whole should be made, so as to reduce the parts of it into regular curves, which must then be treated as such.

Where detached parts of a long form, as legs, arms, spears, swords, &c. occur in any figure, they should be cast in separate molds: and if such parts are of a compound structure, the same rules, as was before intimated, must

be observed in the management of them, as are already directed for the principal part.

In larger masses, where there would otherwise be a great thickness of the plaster, a corps or body may be put within the mold, in order to produce a hollow in the cast; which both saves the expence of the plaster, and renders the cast lighter.

This corps may be of wood, where the forming a hollow of a streight figure, or such as is conical with the basis outward, will answer the end: but if the cavity require to be round, or of any curve figure, the corps cannot be then drawn while intire; and consequently should be of such matter as will suffer itself to be taken out piece meal. In this case, therefore, the corps is best formed of clay: which must be worked upon wires to give it tenacity; and suspended in the hollow of the mold, by cross-wires lying over the mouth: and when the plaster is sufficiently set to bear handling, the clay must be picked out by a proper instrument.

Where it is desired to render the plaster harder, the water with which it is tempered should be mixed with parchment size prepared as below directed; which will make it very firm and tenacious.

In the same manner figures, busts, &c may be cast of lead, or any other metal, in the molds of plaster; only the expence of plaster, and the tediousness of its becoming sufficiently dry, when in a very large mass, to bear the

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heat of melted metal, render the use of clay, compounded with some other proper materials, preferable where large subjects are in question. The clay, in this case, should be washed over till it be perfectly free from gravel or stones; and then mixed with a third or more of fine sand to prevent its cracking: or, instead of sand, coal ashes sifted till they be perfectly fine is preferable. Whether plaster, or clay, be used for the casting in metal, it is extremely necessary to have the mold perfectly dry; otherwise, the moisture, being rarified, will make an explosion, that will blow the metal out of the mold, and endanger the operator, or at least crack the mold in such manner as to frustrate the operation. Where the parts of a mold are larger or project much; and consequently require a greater tenacity of cohesion of the matter they are formed of to keep them together, flocks of cloth, prepared like those designed for the paper hangings, or fine cotton plucked or cut till it is very short, should be mixt with the ashes or sand before they be added to the clay to make the composition for the mold. The proportion should be according to the degree of cohesion required: but a small quantity will answer the end, if the other ingredients of the composition be good; and the parts of the mold properly linked together by means of the wires above directed.

There is a method of taking casts in metals from small animals, and the parts of vegetables, which though not much known or used
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in this country, may be nevertheless practised for some purposes with advantage; particularly for the decorating grottoes or rock work, where nature is imitated. The proper kinds of animals are lizards, snakes, frogs, birds, or insects; the casts of which being properly coloured will be exact representations of the originals.

This is to be performed by the following method. A coffin or proper chest for forming the mold, being prepared of clay, or four pieces of boards fixed together, the animal or parts of vegetables, must be suspended in it by a string; and the leaves, tendrils, or other detached parts of the vegetables, or the legs, wings, &c. of the animals, properly separated and adjusted in their right position by a small pair of pincers; and a due quantity of plaster of Paris, and calcined talc, in equal quantities, with some alumen plumosum, must then be tempered with water to the proper consistence for casting; and the subject from whence the cast is to be taken, as also the sides of the coffin moistened with spirit of wine.

The coffin or chest must be then filled with the tempered composition of the plaster, and talc, putting, at the same time, a piece of straight stick or wood to the principal part of the body of the subject, and pieces of thick wire to the extremities of the other parts, in order, that they may form, when drawn out after the matter of the mold is properly set and firm, a channel for pouring in the

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melted metal, and vents for the air; which otherwise by the rarefaction it would undergo from the heat of the metal, would blow it out or burst the mold. In a short time the plaster and talc will set and become hard; when the stick and wires may be drawn out; and the frame or coffin in which the mold was cast taken away: and the mold must then be put first into a moderate heat, and afterwards, when it is as dry as it can be rendered by that degree, removed into a greater; which may be gradually increased, till the whole be red hot. The animal, or part of any vegetable, which was included in the mold, will then be burnt to a coal; and may be totally calcined to ashes, by blowing for some time gently into the channel and passages made for pouring in the metal, and giving vent to the air; which will, at the same time that it incinerates the remainder of the animal or vegetable matter, blow out the ashes. The mold must then be suffered to cool gently; and will be perfect; the destruction of the substance of the animal or vegetable, having produced a hollow of a figure correspondent to it: but it may be nevertheless proper, to shake the mold, and turn it upside down, as also to blow with the bellows into each of the air vents, in order to free it wholly from any remainder of the ashes: or, where there may be an opportunity of filling the hollow with quicksilver without expence, it will be found a very effectual method of clearing the cavity, as all dust, ashes,

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or small detached bodies, will necessarily rise to the surface of the quicksilver; and be poured out with it. The mold being thus prepared, it must be heated very hot when used, if the cast be made with copper or brass: but a less degree will serve for lead or tin: and the matter being poured in, the mold must be gently struck; and then suffered to rest till it be cold; at which time it must be carefully taken from the cast; but without the least force, for such parts of the matter as appear to adhere more strongly, must be softened by soaking in water, till they be intirely loosened, that none of the more delicate parts of the cast may be broken off or bent.

Where the alumen plumosum, or talc, cannot be easily procured, the plaster may be used alone; but it is apt to be calcined by the heat used in burning the animal or vegetable from whence the cast is taken; and to become of too incohering and crumbly a texture: or for cheapness Sturbridge clay, or any other potters or other good clay, washed over till it be perfectly fine, and mixed with an equal part of sand and some flocks cut small, may be employed. Pounded pumice stone and plaster of Paris, taken in equal quantities and mixed with washed clay in the same proportion, is said to make excellent molds for this and parallel uses.

Casts of medals, or such small pieces, as are of a similar form, may be made in plaster,

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by the method directed for bas-reliefs. Indeed there is nothing more required than to form a mold by laying them on a proper board; and, having surrounded them by a rim made of a piece of a card or any other pasteboard, to fill the rim with soft tempered plaster of Paris: which mold, when dry, will serve for several casts. It is nevertheless a better method to form the mold of melted sulphur; which will produce a sharper impression in the cast, and be more durable, than those made of plaster.

The casts of medals are likewise frequently made of sulphur: which being melted, must be treated exactly in the same manner as the plaster.

Casts may be made, likewise, with iron with very little additional trouble, provided it be prepared in the following manner.

“ Take any iron bar, or piece of a similar
“ form; and, having heated it red hot, hold it
“ over a vessel containing water; and touch
“ it very slightly with a roll of sulphur: which
“ will immediately dissolve it; and make it
“ fall in drops into the water under it. As
“ much iron as may be wanted being thus dissolved, pour the water then out of the vessel; and pick out the drops formed by the
“ melted iron from those of the sulphur,
“ which contain little or no iron, and will be
“ distinguishable from the other by their colour and weight.”

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The iron will, by this means, be rendered so fusible, or easy to be melted, that it will run with less heat than will melt lead; and may be employed for making cast of medals; and many other such purposes, with great convenience and advantage.

Impressions of medals, having the same effect as casts, may be made also of isinglass glue by the following means. Melt the isinglass, beaten as when commonly used, in an earthen pipkin, with the addition of as much water as will cover it, stirring it gently till the whole be dissolved. Then, with a brush of camels hair, cover the medal; which should be previously well cleansed and warmed, and then laid horizontal on a board or table greased in the part around the medal. Let them rest afterwards till the glue be properly hardened; and then, with a pin, raise the edge of it; and separate it carefully from the medal; the cast will be thus formed by the glue as hard as horn; and so light, that a thousand will scarcely weigh an ounce. In order to render the relief of the medal more apparent, a small quantity of carmine may be mixed with the melted isinglass; or the medal may be previously coated with leaf gold by breathing on it, and then laying it on the leaf, which will by that means adhere to it: but the use of the leaf gold is apt to impair a little the sharpness of the impression.

There is likewise a method of making impressions of the same kind in lead: which is this.

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this. Lay the medal on a post, or other firm body of wood; and cover it with a piece of very thin plate of lead; and lay over that another piece of thicker plate. Then place on them endways, a piece of wood turned of a round figure; which may be a foot or more in length; and of such thickness, that its diameter may be somewhat greater than that of the medal. Strike then forcibly on the upper end of the wood with a mallet, or some such instrument; and the undermost plate of lead will receive the impression of the medal: to preserve which, the concave of the reverse may be filled up with resin, mixed with an equal part of brick-duft, and melted. The impression should be made with one stroke; which will produce a sufficient effect, if given with due strength, and in a perpendicular direction. Impressions may be even taken from sealing wax or sulphur in this manner, if the pieces be no way concave or bending on their under side.

Impressions of medals may be likewise taken in putty; but it should be the true kind made of earth of tin and drying oil. These may be formed in the molds previously taken in plaster or sulphur, or molds may be made in its own substance, in the manner directed for those of the plaster. These impressions will be very sharp and hard: but the greatest disadvantage, that attends them, is their drying very slowly, and being liable in the mean time to be damaged.

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Impressions of prints, or other engravings, may be taken from copper plates by cleaning them thoroughly ; and pouring plaster upon them : but the effect, in this way, is not strong enough for the eye: and therefore the following method is preferable, where such impressions on plaster are desired.

Take vermilion, or any other coloured pigment, finely powdered, and rub it over the plate. Then pass a folded piece of paper, or the flat part of the hand, over the plate to take off the colour from the lights or parts where there is no engraving. The proceeding must then be the same, as where no colour is used. This last method is also applicable to the making impressions of copper plates on paper with dry colours : for the plate being prepared as here directed, and laid on the paper properly moistened, and either passed under the rolling press, or any other way strongly forced down on the paper, an impression of the engraving will be obtained.

Impressions may be likewise taken from copper plates, either on plaster or paper, by means of the smoke of a candle or lamp ; if, instead of rubbing them with any colour, the plate be held over the candle or lamp, till the whole surface become black, and then wiped off by the flat of the hand, or paper.

These methods are not, however, of very great use in the case of copper plates ; except where impressions may be desired on occasions where printing ink cannot be procured: but as they

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they may be applied likewise to the taking impressions from snuff-boxes, or other engraved subjects, by which means designs may be instantly borrowed by artists or curious persons, and preserved for any use, they may in such instances be very useful.

The expedient of taking impressions by the smoke of a candle or lamp may be employed, also, for botanical purposes in the case of leaves; as a perfect and durable representation of not only the general figure, but the texture and disposition of the larger fibres, may be extemporaneously obtained at any time. The same may be, nevertheless, done, in a more perfect manner, by the use of linseed oil, either alone, or mixed with a small proportion of colour, where the oil can be conveniently procured: but the other method is valuable on account of its being practicable at almost all seasons, and in all places, within the time that the leaves will keep fresh and plump. In taking these impressions, it is proper to bruise the leaves, so as to take off the projections of the large ribs, which might prevent the other parts from plying to the paper.

Leaves, or also the petals, or flower leaves of plants, may themselves be preserved on paper, with their original appearance, for a considerable length of time, by the following means. Take a piece of paper, and rub it over with the isinglass glue treated as above directed for taking impressions from medals; and then lay the leaves in a proper position
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on the paper. The glue laid on the paper being set, brush over the leaves with more of the same; and that being dry likewise, the operation will be finished: and the leaves so secured from the air and moisture, that they will retain their figure and colour much longer than by any other treatment.

Butter flies, or other small animals of a flat figure, may also be preserved in the same manner.

PART



PART III.

Of gilding, silvering, bronzing, japaning, laquering, and the staining different kinds of substances, with all the variety of colours.

CHAP. I.

Of gilding.

SECT. I. *Of gilding in general.*

THE gilding different substances is performed by a variety of means accommodated to the nature of each : but the principle is the same in all ; (except with respect to one kind practised on metals, where quicksilver or heat is used, which I omit here as not properly a part of the subject of this work ;) being only the putting some proper cement on the body to be gilt ; and then laying the gold either in the form of leaves, or powder, on the cement ; which binds it to the body.

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The principal kinds of gilding are those called oil gilding ;—varnish gilding ;—and jaspers gilding or gilding with gold size. These may be promiscuously used on grounds either of wood, metal, or any other firm and rigid body : but paper and leather require a treatment in some cases peculiar to themselves.

The first attention, in most kinds of gilding, is the choice of leaf gold : which should be pure, and of the colour accommodated to the purpose, or taste, of the work. Purity is requisite in all cases : for if the gold be allayed with silver it will be of too pale and greenish a hue for any application ; and if it contain much copper, it will in time turn to a yet much stronger green. The purity may be ascertained with accuracy enough for this purpose, by the touchstone, and aqua fortis ; and the fitness of the colour, to any particular purpose, may be distinguished by the eye. The full yellow is certainly the most beautiful and truest colour of gold : but the deep reddish cast has been of late most esteemed from the caprice of fashion : which ever may be chosen, the colour ought nevertheless to be good of the kind ; for there is a great variation in the force and effect of different parcels of the same tint ; some appearing more foul and muddy ; others bright and clear.

The best method however of judging of the colour of leaf gold with nicety, is by keeping a specimen of such as is perfect ; with
which

which any fresh parcel may be occasionally compared.

There is, besides the true leaf gold, another kind in use, called Dutch gold : which is copper gilt and beaten into leaves like the genuine. It is much cheaper ; and has when good greatly the effect of the true at the time of its being laid on the ground ; but, with any access of moisture, it loses its colour, and turns green in spots ; and, indeed, in all cases, its beauty is soon impaired, unless well secured by laquer or varnish. It is nevertheless serviceable for coarser gilding, where large masses are wanted ; especially where it is to be seen by artificial light as in the case of theatres : and if well varnished will there in a great measure answer the end of the genuine kinds.

The other preparations of gold, belonging to particular kinds of gilding, I shall treat of them, as likewise the cements or other substances employed, in their respective places ; and proceed now to shew, what the instruments are, which are common to the three principal methods.

SECTION II.

Of the instruments that are common to the oil, varnish, and japaners gilding.

THE first necessary instrument is, a cushion for receiving the leaves of gold from the paper, in order to its being cut into proper size and figures, for covering the places to be gilt. This cushion should be made of leather, and fastned to a square board, which should have a handle. It may be of any size from fourteen inches square to ten; and should be stuffed betwixt the leather and board with fine tow or wool; but in such manner that the surface may be perfectly flat and even.

A proper knife is the next, and an equally requisite instrument; as it is necessary in all cases to cut or divide the gold into parts correspondent to those, which are to be covered. This knife may be the same in all respects as those used in painting, called *palette knives*; the blade of which may be four or six inches long, and somewhat more than half an inch in breadth, with a handle proportionable.

A squirrel's tail is likewise generally provided, for taking up the whole leaves, and for compressing the gold to the surface where it is laid, and giving it the position required; and is used also by some for taking up the parts of leaves; but this is better done by means of a ball of
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cotton wool; which will both answer this end and that of compressing the gold in a more easy and effectual manner. This squirrel's tail is cut short, and sometimes spread in the fan fashion by means of a piece of wood formed like a pencil stick, but broad at one end, and split to receive the tail; but it will equally serve the purpose in its own form when the hair is cut to a proper length. This instrument is by some called a pallet; but improperly; as the board for holding the colours in painting, and which is frequently in use along with this, being called by the same name, would necessarily produce a confusion in speaking of either.

A brush of very soft hog's hair, or of the fitch kind, made large, is likewise commonly used for passing over the work when it is become dry, in order to take off the loose gold.

Some fine cotton wool is also necessary for taking up the smaller parts of the leaves, and laying them on the work: as also for compressing and adjusting them when laid on. The cotton should be formed into a ball by tying it up in a piece of fine linnen rag; for if it be used without the rag, the fibres adhere to the gold size, and embarrass the work.

A small stone and muller, with a proportionable pallet knife, are required for grinding and tempering the mixtures made of the fat oil, or gold size, with each other, and the colours that may be added to them: as also proper

per brushes for laying on, and spreading the fat oil, or size, on the work : and some of these should be fitches of different sizes ; in order to convey, and settle the gold, where the relief of carved work forms deep hollows.

These are all the instruments that are common to all the three principal kinds of gilding ; such as are peculiar to each, I shall take notice of where they more properly occur.

S E C T I O N I I I .

Of the manner of oil gilding, and the preparation of fat oil.

THE gilding with oil is the most easy and cheap, as well as most durable kind ; and, therefore, is mostly applied to common purposes. It is performed by cementing the gold to the ground, by means of fat oil. The preparation of which is, therefore, previously necessary to be known ; and may be much better managed in the following manner, than by any method hitherto taught, or commonly practised.

“ Take any quantity of linseed oil ; and
 “ put it into an earthen, or any other vessel of
 “ a broad form : so that the oil may lie in it
 “ with a very large surface ; but the propor-
 “ tion

“ tion should be so limited that the oil may be
“ about an inch thick in the vessel. The earthen
“ pans used for milk in the forming cream for
“ butter are very well accommodated to this
“ purpose. Along with the oil as much wa-
“ ter should be also put into the vessel, as will
“ rise six inches or more above the bottom.
“ Place it then, with the oil swimming on
“ the water, in any open place where the sun
“ and rain may have access to it; but where
“ it may be as free from receiving dust and
“ filth as possible. Let it stand in this condi-
“ tion, stirring it on every opportunity, for
“ five or six weeks, or till it appear of the
“ consistence of treacle. Take it then from
“ off the water, into a phial, or bottle of a
“ long form, or what is better, into a separat-
“ ing funnel, such as is used by the chemists,
“ and there draw off the remainder of the
“ water. Place it afterwards, being in the long
“ bottle or phial, in such heat as will ren-
“ der it perfectly fluid; and the foulnesses it
“ may contain will soon subside to the bot-
“ tom; when the clear part must be poured
“ off; and the remainder strained through a
“ flannel, while yet water, and will then be
“ fit for use.”

It is to be observed that this method is only practicable in summer: as the sun has not sufficient power in winter to produce a due change in the oil.

This method differs from that commonly practised, in the addition of the water; which

suffers the foulness to separate from the oil and sink to the bottom, where it remains without being again mixed with the oil every time it is stirred, as is unavoidable where no water is used : and likewise greatly contributes to bleach the oil, and improve it in other respects.

The best previous preparation of the piece to be gilded, if it have not already any coat of oil paint, is to prime it with drying oil mixed with a little yellow oker ; to which, also, a very small proportion of vermilion may be added : but where greater nicety and perfection is required in the work, the wood should be first rubbed with fish skin ; and then with Dutch rushes.

This priming being dry, the next part of the operation is the sizing the work ; which may be done, either with the fat oil alone ; (but diluted with drying oil, if too thick to be worked without) or with fat oil and the japaner's gold size, (of which the preparation is below taught) either in equal quantities, or in any less proportion with respect to the gold size. The difference betwixt the use and omission of the gold size, in this way of gilding, lies in two particulars ; the one is, that the sizing dries faster according to the proportion of the quantity of the gold size to the fat oil, and is consequently so much the sooner fit to be gilded : the other is, that the gilding is also rendered, in the same proportion, less shining and glossy ; which is esteemed a perfection in this kind of
gilding :

gilding : though, taking away the prejudice of fashion, I should think the most shining the most beautiful ; and of the strongest effect.

The fat oil, or the compound of that and the gold size, must be ground with some yellow oker ; and then, by means of a brush, laid thinly over the work to be gilt : but, in doing this, care must be taken, to pass the brush into all the hollows and cavities, if the subject be carved, or have any other way projecting parts. For where the size fails to be laid on, the gold will never take, till the work be again repaired by passing over the defective places with fresh size : which should be avoided as much as possible. Where great perfection is required, the gold should not be laid on the first sizing ; but that being suffered to dry, the work should be again sized a second time : and some who are very nice even proceed to a third.

The work being thus sized must be kept till it appear in a proper condition to receive the gold : which must be distinguished by touching with the finger ; when, if it appear a little adhesive or clammy ; but not so as to be brought off by the finger, it is in a fit condition to be gilt : but if it be so clammy as to daub or come off on being touched, it is not sufficiently dry, and must be kept longer : or if there be no clamminess or sticky quality remaining, it is too dry, and must be sized over again before it can be gilt.

When the work is thus ready to receive the gold, the leaves of gold, where the surface is

sufficiently large and plain to contain them, may be laid on, either by means of the squirrel's tail ; or immediately from the paper in which they were originally put ; a method, that, by those who have the proper dexterity of doing it, is found to be much the simplest and quickest, as well as best, for the perfection of the work. Being laid on the proper parts of the work, the leaves must then be settled to the ground, by compressing those, which appear to want it, gently with the squirrel's tail or cotton ball ; and if any part of the gold has flown off, or been displaced, so as to leave a naked or uncovered part, a piece of another leaf, of size and figure correspondent to such part, must be laid upon it. Where the parts are too small to admit of the laying on whole leaves, or where vacancies are left after laying on whole leaves which are less than require others to cover them, the leaves which are to be used must be turned from the paper upon the cushion (described above amongst the instruments ;) and cut, by scoring over them, with the knife, (above described likewise,) into such divisions or slips as may be most commodiously laid on the parts of the work to be covered : and then, being separated, and taken up as they are wanted by means of the cotton wool, to which being breathed upon they will adhere, they must be laid in the places they are designed to cover ; and gently pressed by the cotton, till they touch every where, and lie even on the ground.

Where

Where the work is very hollow, and small pieces are wanted to cover parts that lie deep and out of the reach of the squirrel's tail or the cotton, they may be taken up by the point of a fitch pencil (being first breathed upon) and by that means conveyed to and settled in their proper place : and those who are accustomed to it use the pencil commodiously for a great part of the work where large parts of the leaves cannot be used.

The whole of the work being thus covered should be suffered to remain till it be dry ; and may then be brushed over by a camel's hair pencil or soft hog's hair brush, to take off from it all loose parts of the gold.

If after the brushing any defective parts, or vacancies appear in the gilding, such parts must be again sized ; and treated in the same manner as the whole was before : but the japaner's gold size alone is much better for this purpose than either the fat oil alone, or any mixture.

S E C T I O N I V .

Of burnish gilding ; with the preparation of the proper sizes, &c.

THE gilding with burnisht gold is seldom practised, but upon wood ; and at present mostly in the case of carved work, or where carved work is mixed with plain. The
chief

chief difference in the manner betwixt this and oil gilding lies in the preparing the work to receive the gold ; and in the substituting a size made of parchment, or the cuttings of glover's leather in the place of the fat oil, as a cement : the preparation of which size should, therefore, be previously known ; and may be as follows.

+ “ Take a pound of cuttings of parchment,
“ or of the leather used by glovers ; and,
“ having added to them six quarts of water,
“ boil them till the quantity of fluid be reduced to two quarts : or till, on the taking out a little, it will appear like a jelly on growing cold. Strain it through flannel while hot ; and it will be then fit for use.”

This size is employed in burnish gilding, not only in forming the gold size, or cement for binding the gold to the ground ; but also in priming, or previously preparing the work : but before I proceed to shew the manner of using it so, it is necessary to give the compositions for the proper cement or gilding size employed in this kind of gilding. There are a multiplicity of recipes for this composition, which are approved of by different persons : but as in general they vary not essentially from each other, I will only give two, which I believe to be each the best in their kinds.

“ Take any quantity of bole armoniac, and
“ add some water to it, that it may soak till it
“ grow soft ; levigate it then on the stone,
“ but not with more water than will prevent
“ its

“ its being of a stiff consistence; and add to it
“ a little purified suet or tallow scraped; and
“ grind them together. When this is wanted for
“ use, dilute it to the consistence of cream, by
“ parchment or glovers size, mixt with double
“ its quantity of water, and made warm. Some
“ melt the suet or tallow, and mix it previously
“ with five or six times its weight of chalk be-
“ fore it is put to the bole, to facilitate their
“ commixture; to which in this wet state they
“ are otherwise somewhat repugnant. It is
“ also sometimes practised to put soap-suds to
“ the bole; which will contribute to its unit-
“ ing with the tallow.”

This is the simplest composition, and equal-
ly good with the following, or any other;
but for the indulgence of the variety of opi-
nions, which reigns in all these kinds of mat-
ters, I will insert another.

“ Take of bole in fine powder one pound,
“ and of black lead two ounces. Mix them
“ well by grinding; and then add of olive
“ oil two ounces, and of bees-wax one ounce,
“ melted together; and repeat the grinding
“ till the whole be thoroughly incorporated.
“ When this mixture is to be used, dilute it
“ with the parchment or glovers size, as was
“ directed in the former recipe: but, in the
“ mean time, both this and the foregoing
“ should be kept immersed in water, which
“ will preserve them good.”

To prepare the wood for burnish gilding,
it should first be well rubbed with the fish-
skin

skin; and then with the Dutch rushes: but this can only be practised in the larger and plainer parts of the work, otherwise it may damage the carving, or render it less sharp by wearing off the points. It must then be primed with the glovers size, mixed with as much whiting as will give it a tolerable body of colour: which mixture must be made by melting the size, and strewing the whiting in a powdered state gradually into it; stirring them well together, that they may be thoroughly incorporated. Of this priming seven or eight coats should be given, time being allowed for the drying of each before the other be put on; and care should be taken, in doing this, to work the priming well, with the brush, into all the cavities or hollows there may be in the carved work. After the last coat is laid on, and before it be quite dry, a brush pencil dipt in water should be passed over the whole to smooth it and take away any lumps or inequalities that may have been formed: and when it is dry the parts which admit of it should be again rushed over till they be perfectly even. The work should then be repaired by freeing all the cavities and hollow parts from the priming, which may choak them, or injure the relief of the carving: after which a water polish should be given to the parts designed to be burnished, by rubbing them gently with a fine linnen rag moistened with water.

The work being thus prepared, when it is to be gilt, dilute the composition of bole, &c. with

with warm size mixt with two thirds of water; and with a brush spread it over the whole of the work, and then suffer it to dry; and go over it again with the mixture, in the same manner, at least once more. After the last coat, rub it in the parts to be burnished, with a soft cloth, till it be perfectly even. Some add a little vermilion to the gilding size, and others colour the work, if carved, before it be laid on, with yellow and the glovers size; to which a little vermilion, or red lead, should be added. This last method is to give the appearance of gilding to the deeper and obscure parts of the carving, where the gold cannot, or is not thought necessary, to be put: but this practice is at present much disused; and instead of it such parts of the work are coloured after the gilding; which treatment is called *matting*.

Having the work properly prepared, and set in a position almost perpendicular, but declining a little from you, and having the gilding size, and all the necessary instruments above described ready, as also a basin of clean water, wet the uppermost part of the work, by means of a large camel's hair pencil dipped in the water; and then lay on the gold upon the part so wet, in the manner above directed for the gilding in oil, till it be completely covered, or become too dry to take the gold: and then proceed to wet the next part of the work, or the same over again if necessary, and gild it as the first;

first; repeating the same method till the whole be finished. Some wet the work with brandy, or spirit of wine, instead of water; but I do not conceive any advantage can arise from it, that may not be equally obtained by a judicious use of water; and this manner is much more troublesome and difficult, as well as expensive, for only a small part must be wet at one time, and the gold laid instantly upon it, or the brandy or spirits will fly off, and leave the ground too dry to take the gold.

The work being thus gone over with the gilding, must be then examined; and such parts as require it repaired, by wetting them with the camels hair pencil, and covering them with the gold; but as little as possible of the perfect part of the gilding should be wet, as the gold is very apt to turn black in this state. When the repaired part also is dry, the work may be *matted* if it require it: that is, the hollow parts must be covered with a colour the nearest in appearance to gold. For this purpose some recommend red lead, with a little vermilion ground up with the white of an egg: but I think yellow oker or Dutch pink with red lead, would better answer the end: or the terra de Siena very slightly burnt or mixed with a little red lead would have a much better effect; and be more durable than any other mixture so near the colour of gold in shade. Ifinglass size will likewise equally well supply the place of the whites of eggs in the composition for matting.

The

The work being thus gilt, it must remain about twenty-four hours; and then the parts of it that are designed to be burnished, must be polished with the dog's tooth, or with the burnishers of agate or flint made for this purpose: but it should be previously tried, whether it be of the proper temper as to the dryness; for though twenty-four hours be the most general space of time, in which it becomes fit, yet the difference of season, or the degree of wet given to the work, makes the drying irregular, with regard to any fixt period. The way of distinguishing the fitness of the work to take the burnish, is to try two or three particular parts at a distance from each other; which, if they take the polish in a kindly manner, the whole may be concluded fit: but if the gold peel off, or be disordered by the rubbing, the work must be deemed not yet dry enough: and if the gold abide well the rubbing, and yet receives the polish slowly, it is a proof of its being too dry: which should be always prevented by watching the proper time; as the work, when too dry, both requires much more labour to burnish it, and fails at last of taking so fine a polish.

SECTION V.

Of Japaners gilding.

THE Japaners gilding is performed by means of gold powder, or imitations of it, cemented to the ground by a kind of gold size much of the nature of drying oil: for the making which, there are various recipes followed by different persons. I shall, however, only give one of the more compound, that is much approved; and another very simple, but which, nevertheless, is equally good for the purpose with the most elaborate. The more compound gold size may be thus made.

“ Take of gum animi and asphaltum each
 “ one ounce, of red lead, litharge of gold, and
 “ umbre, each one ounce and a half. Re-
 “ duce the grosser ingredients to a fine pow-
 “ der; and having mixed them, put them,
 “ together with a pound of linseed oil, into
 “ a proper vessel, and boil them gently; con-
 “ stantly stirring them, with a stick or to-
 “ bacco-pipe, till the whole appear to be in-
 “ corporated. Continue the boiling, fre-
 “ quently stirring them, till on taking out a
 “ small quantity, it appear thick like tar, as
 “ it grows cold. Strain the mixture then
 “ through flannel; and keep it carefully stopp-
 “ up in a bottle, having a wide mouth, for
 “ use.

“ use. But when it is wanted, it must be
 “ ground with as much vermilion, as will
 “ give it an opaque body, and at the same
 “ time diluted with oil of turpentine, so as to
 “ render it of a consistence proper for work-
 “ ing freely with the pencil.”

The asphaltum does not, I conceive, con-
 tribute to the intention of this kind of size:
 and the litharge of gold, and red lead, are
 both the same thing, with respect to this pur-
 pose, under different names: and neither they
 nor the umbre necessary, but clogging ingre-
 dients to the composition.

This gold size may therefore be equally
 well, or perhaps better prepared, in the fol-
 lowing manner.

“ Take of linseed oil one pound, and of
 “ gum animi four ounces. Set the oil to
 “ boil in a proper vessel; and then add the
 “ gum animi gradually in powder; stirring
 “ each quantity about in the oil, till it appear
 “ to be dissolved; and then putting in ano-
 “ ther, till the whole be commixt with the
 “ oil. Let the mixture continue to boil, till,
 “ on taking a small quantity out, it appear of
 “ a thicker consistence than tar: and then
 “ strain the whole through a coarse cloth, and
 “ keep it for use: but it must, when used, be
 “ mixed with vermilion and oil of turpentine,
 “ in the manner directed for the foregoing.”

This gold size may be used on metals,
 wood, or any other ground whatever: but be-
 fore I enter on the particular manner of gild-

ing with it, the preparation of the true, and counterfeit, gold powders are necessary to be shewn.

The true gold powder may be well and easily made by the following method.

“ Take any quantity of leaf gold; and grind
 “ it with virgin hony, on a stone, till the
 “ texture of the leaves be perfectly broken,
 “ and their parts divided to the minutest de-
 “ gree. Then take the mixture of gold and
 “ hony from off the stone; and put it into a
 “ China or other such bason, with water;
 “ and stir it well about, that the hony may
 “ be melted; and the gold by that means
 “ freed from it. Let the bason afterwards
 “ stand at rest, till the gold be subsided; and
 “ when it is so, pour off the water from it;
 “ and add fresh quantities till the hony be in-
 “ tirely washed away; after which the gold
 “ may be put on paper, and dried for use.”

The German gold powder, which is the kind most generally used, and, where it is well secured with varnish, will equally answer the end in this kind of gilding with the genuine, may be prepared from the sort of leaf gold, called the *Dutch gold*, exactly in the same manner as the true.

The aurum Mosaicum, which is tin coloured, and rendered of a flaky or pulverine texture, by a chemical process, so as greatly to resemble gold powder, may be likewise used in this kind of gilding; and prepared in the following manner.

“ Take of tin one pound, of flowers of sulphur seven ounces, of sal ammoniacum and purified quicksilver each half a pound: Melt the tin; and add the quicksilver to it in that state: and when the mixture is become cold, powder it, and grind it with the sal ammoniacum and sulphur, till the whole be thoroughly commixt. Calcine them then in a matrafs; and the other ingredients subliming, the tin will be converted into the aurum Mosaicum; and will be found in the bottom of the glass like a mass of bright flaky gold powder: but if any black or discoloured parts appear in it, they must be carefully pickt or cut out.”

The sal ammoniacum employed ought to be perfectly white and clean; and care should be taken, that the quicksilver be not such as is undulterate with lead, which may be known by putting a small quantity in a crucible, into the fire, and observing when it is taken out, whether it be wholly sublimed away, or have left any lead behind it. The calcination may be best performed in a coated glass body, hung in the naked fire; and the body should be of a long figure, that the other ingredients may rise so as to leave the coloured tin clear of them. The quicksilver, though it be formed into cinnabar along with the sulphur, need not be wasted; but may be revived by distilling it with the addition of quick-lime; for which a very cheap and com-

modious method and apparatus may be found in a late treatise on practical chemistry, intitled, *The Elaboratory laid open*, &c.

There are some other coarser powders in imitation of gold, which are formed of precipitations of copper: but as they are seldom used now for gilding, I shall defer shewing the manner of preparing them, till I come to speak of bronzing, where they more properly occur.

Besides these powders, the genuine leaf or Dutch gold may be used with the japaners gold size, where a more shining and glossy effect is desired in the gilding: but in that kind of gilding which is intended to be varnished over, or to be mixed with other japan work or paintings in varnish, the powders are most frequently employed.

The gilding with japaners gold size may be practised on almost any substance whatever, whether wood, metal, leather, or paper: and there is no further preparation of the work necessary to its being gilt, than the having the surface even and perfectly clean.

The manner of using the japaners size, is to put a proper quantity of it, prepared as above directed, and mixt with the due proportion of oil of turpentine and vermilion, into a small gally pot, or one of those tin vessels above described, for containing the colours when used for painting on varnish; and either to spread it with a brush over the work, where

where the whole surface is to be gilt; or to draw with it by means of a pencil the proper figure desired, avoiding carefully to let it touch any other parts; and then to suffer it to rest till it be fit to receive the gold: which must be distinguished by the finger, in the same manner as with the fat oil; the having a proper clamminess or sticky quality without being so fluid as to take to the finger, being alike the criterion in both cases. Being found of a proper dryness, when the gold powders are to be used, a piece of the soft leather, called *wash-leather*, wrapt round the fore-finger, must be dipt in the powder, and then rubbed very lightly over the sized work; or, what is much better, the powder may be spread by a soft camel's hair pencil; and the whole being covered, it must be left to dry; and the loose powder may then be cleared away from the gilded part, and collected, by means of a soft camel's hair brush. When leaf gold is used, the method of sizing must be the same as for the powders: but the point of due dryness is very nice and delicate in these cases; for the leaves must be laid on while the matter is in a due state, otherwise the whole of what is done must be sized and gilt over again.

When more gold size is mixt up with the oil of turpentine, and vermilion, than can be used at one time, it may be kept by immersing it under water till it be again wanted: which is indeed a general method of preserving all kind

of paint, or other such compositions as contain oily substances.

SECTION VI.

Of gilding paper, and vellum or parchment.

THERE are a variety of methods used for gilding paper, according to the several ends it is designed to answer; but for the most part size, properly so called, and gum water, are used as the cements; and the powders are more generally employed than the leaf gold. As I have given the preparation of these several substances before, it is needless to repeat them here; and I shall therefore only point out those circumstances in the manner of their use, which are peculiar to the application of them to this purpose.

Of the gildings on paper proper to be used along with painting in water colours, or fresco.

The gilding proper to be used with water colours may be either with the leaf gold, or powder; which last, when mixt with the proper vehicle, is called *shell gold*.

The leaf gold is necessary in all cases, where a metalline and shining appearance is wanted:
and

and it may be laid on the designed ground by means either of gum water, or isinglass size. The gum water or size should be of the weaker kind, and not laid too freely on the ground; and proper time should likewise be given for it to dry: the judgment on which must be formed, in this case, as in the other kinds of gilding, by touching with the finger. The management of the gold also is much the same in this as in the former: and where a polished appearance is wanting, the dog's tooth or other kind of burnisher may be used. In the gilding larger surfaces, it will be found advantageous to colour the ground with the gall-stone: and where colours are to be laid on the gilding, the brushing the gold over with the gall of any beast, will make it take them in a much more kindly manner.

When the gold powders are used along with paintings in water colours, it is previously formed into *shell gold*, (as it is called, from its being usually put into muscle shells, in the same manner as the colours). This shell gold is prepared by tempering the gold powder with very weak gum water; to which a little soap-suds may be put, to make the gold work more easily and freely. The preparation of the gold powders is before given, p. 386, and that of the gum water p. 168.

Of the gilding proper for the coloured paper for binding books, and other such purposes.

This kind of gilding is performed in much the same manner as that for mixing with paintings in water colours; except that in this case, the gilding being intended generally to form some figure or design, the gum water or size, instead of being laid on with a brush or pencil, is most generally conveyed to the ground by means of a wooden plate, or print, and most expediently by an engraved roller, which make an impression of the figure or design intended; and that, as the rising of the gold from the surface of the ground is no disadvantage in this kind of gilding, as it is in that mixt with paintings, the gum water or size may be much stronger; which will contribute both to bind the gold firmer, and to give it a sort of embossed appearance that improves the effect. In this kind of gilding, the japaners gold size may be also commodiously employed; for, as the paper must be moistened before it be printed, there is no inconvenience liable to happen from the running of the gold size thus used. Where the embossed appearance is wanted in the greatest degree, the gold size should indeed always be used: and in this case should be thickened with yellow oker mixt with as much red lead, as the proper working of the print will admit.

The

The wooden plates or prints used for gilding in this manner, are worked by the hand, and are to be charged with the gum water or size, of whatever kind it be, by letting it gently and evenly down on a cushion on which the gum water or size has been copiously spread by means of a proper brush; and then pressing it on the paper prepared by moistening with water, and laid horizontally with some sheets of other paper under it. Where the rolling print is employed, the gum water or size must be laid on it by a proper brush, immediately out of the pot or vessel which contains it: but too copious an use must be avoided for fear of spreading it beyond the lines of the design or pattern. The subsequent management of the gold, whether leaf or powder, must be the same in the foregoing kinds of gilding.

It rarely answers to use the leaf gold in this kind of painting, nor even the true gold powder: but the German powder, or that formed of the leaves called *Dutch gold*, is mostly employed, and answers well enough the purpose. The manufactures of the gilt and marbled papers have not been so much cultivated in our own country, as it were to be wished, since very great sums have been always annually paid, both to Germany and Genoa, on this account: and the improvement of this manufacture is, therefore, a very fit object of attention to that most laudable society for the establishment and encouragement of useful arts, who have offered premiums to those who
would

would give proofs of their endeavours or success in parallel instances.

Of gilding proper for letters of gold on paper, and the embellishment of manuscripts.

The most easy and neat method of forming letters of gold on paper, and for ornaments of writings is, by the *gold armoniac*, as it was formerly called: the method of managing which is as follows.

“ Take gum Ammoniacum, and powder
“ it; and then dissolve it in water previously
“ impregnated with a little gum Arabic, and
“ some juice of garlic. The gum Ammonia-
“ cum will not dissolve in water, so as to form
“ a transparent fluid, but produces a milky
“ appearance; from whence the mixture is
“ called in medicine the *lac Ammoniacum*.
“ With the lac Ammoniacum thus prepared,
“ draw with a pencil, or write with a pen on
“ paper, or vellum, the intended figure or
“ letters of the gilding. Suffer the paper
“ to dry; and then, or any time afterwards,
“ breath on it till it be moistened; and
“ immediately lay leaves of gold, or parts
“ of leaves cut in the most advantageous man-
“ ner to save the gold. over the parts drawn

“ with a soft pencil, or rub off by a fine linen rag, the redundant gold which covered the parts between the lines of the drawing or writing; and the finest hair strokes of the pencil or pen, as well as the broader, will appear perfectly gilt.”

It is usual to see in old manuscripts, that are highly ornamented, letters of gold which rise considerably from the surface of the paper or parchment containing them in the manner of embossed work; and of these some are less shining, and others have a very high polish. The method of producing these letters is of two kinds; the one by friction on a proper body with a solid piece of gold: the other by leaf gold. The method of making these letters by means of solid gold is as follows.

“ Take chrystal; and reduce it to powder.
“ Temper it then with strong gum water, till it be of the consistence of paste; and with this, form the letters; and, when they are dry, rub them with a piece of gold of good colour, as in the manner of polishing; and the letters will appear as if gilt with burnisht gold.”

Kunckel has, in his fifty curious experiments, given this receipt: but omitted to take the least notice of the manner, how these letters are to be formed; though the most difficult circumstance in the production of them. It may, however, be done by means of a stamp in this manner. Let the embossed figure, either of the separate letters or of whole words, be cut in steel;

steel ; and, when the stamps are to be used, anoint each letter carefully with the end of a large feather dip in oil ; but not so wet as to leave drops in the hollows of the stamps. Fill these concave letters, in the stamps, with the above mixture of powdered chrystal and gum water ; and, wiping the other parts of them perfectly clean, place them then on the paper or vellum, laid over some sheets of paper : taking care, that the letters may be in the exact position where they ought to lie, strike then the stamp in a perpendicular direction, but not too forcibly ; and take it off in the same direction. The letters will be left in their proper places by this means, and will have the same proportions as their archetypes in the stamps.

Where leaf gold is used for making embossed letters in manuscripts, the above composition cannot be used ; but there are several others, which will very well supply its place : of which the following has been given as very excellent.

“ Take the whites of eggs ; and beat them
“ to an oily consistence. Then take as much
“ vermilion as will be required to thicken the
“ whites of the eggs to the consistence of paste.
“ Form the letters of this paste, by means of
“ the stamps, in the manner before directed ;
“ and when they are become dry, moisten
“ them by a small pencil with strong gum
“ water ; observing not to let it run beyond the
“ bounds of the letters. When the gum wa-
“ ter is of a proper dryness, which must be
“ judged

“ judged of by the rule before given, cover
 “ the letters with leaf gold; and press it close
 “ to every part of them, by cotton or soft
 “ leather. After the gilding is dry, it may be
 “ polished by the dog’s tooth, or the other pro-
 “ per burnishes.”

Of gilding proper for the edges of books and paper.

There are several various methods, with respect to the cement used, by which the edges of books or paper may be gilt: as strong gum water, or isinglass size, or glover’s size, may be employed: but as the gum water, and weaker sizes, are apt to run beyond the edge; and stick the leaves together, isinglass melted with the addition of some common proof spirit of wine, and a sixth part of hony or sugar candy is greatly preferable: but a third of bole armoniac well powdered must be added.

The following composition has been likewise approved of for this purpose.

“ Take bole armoniac, and sugar candy well
 “ powdered, each equal parts: mix them with
 “ the whites of eggs beaten to an oily consist-
 “ ence; and the cement will be fit for use.”

In order to the using any of these cements, the paper, whether it be in quires, or books, should be well cut, and polished on the edges to be gilt; and then strongly screwed down by the press; in which state, it is to be brushed over, first with a little of the cement without the sugar candy, or the bole; and when that
 is

is dry, either with the cement above given, or any other solution of gum or size with the proper proportion of the bole: after which it may be suffered to dry; and then water polished by rubbing it with a fine linnen rag slightly moistened. It is then in a state fit for receiving the gold; only it must be again gently moistened at that time: and the leaves may then be laid on, being cut according to the breadth they are to cover; and pressed closely down by a cotton ball: and after the gilding is thoroughly dry and firm, it may be polished in the manner of the foregoing kinds.

S E C T I O N VII.

Of gilding leather.

LEATHER may be gilded by all the same methods which have been given for gilding paper, or vellum; except, that where the gold size is used, there is no occasion to wet the leather to prevent the running of the oil out of the bounds. Either leaf gold or the powders may therefore be employed as well for leather, as paper: but, unless in the finer work of the japaning leather gilders, or other particular uses, the German powder alone is used. It is needless consequently to repeat here the methods above shewn with respect to the gilding paper for
covers

covers to books, &c. which equally well suit for this purpose in general : but as there is a manner of gilding leather peculiar to the book-binders, it is requisite to explain it.

The method of gilding used by the book-binder is to have the letters, or copartments, scrolls, or other ornaments, cut in steel stamps; not by sinking, as in most other cases, but by the projection of the figure from the ground. These stamps are made hot; and leaves of gold being laid on the parts accommodated to the pattern or design of the gilding, the hot stamps are prest strongly on the gold and leather; and bind the gold to it in the hollows formed by the stamp: the other redundant part of the gold being afterwards brushed or rubbed off.

SECTION VIII.

*Of gilding of glass without annealing
or burning.*

GLASS may be gilt, by applying as a cement any gold size, or other size, gum water, or varnish; and, when it is of a proper degree of dryness, laying on the gold as in the other methods of gilding: and polishing it also in the same manner, if the burnisht appearance be desired: but where that is intended, it is proper to add bole armoniac, chalk,

chalk, or other such substance to the cement.

When drinking glasses are to be gilt, without burning, the cement should be either some gold size formed of oil, or some kind of varnish compounded of the gum resins, that will not dissolve in water; but require either spirit of wine or oil of turpentine for their solution: at present, nevertheless, this is not only neglected by those who gilt drinking glasses for sale; but glasses gilded with gum arabic, or the sizes which will dissolve in water, are imposed upon the public for the German glasses gilt with the annealed gold; and sold at a dear rate under that pretence; though after they have been used for a very short time, the gold peels and rubs off in spots when the glasses are cleaned; and renders them very unsightly. As the glasses with gilt edges are at present much in fashion, and the true kind are brought from Germany or elsewhere, the incitement of the cultivating this branch of gilding here would not be an unfit object of the premiums of the worthy society for the encouragement of arts: since for the doing this work in perfection, there is nothing more wanting than that dexterity of the manœuvre, which arises from a little practice in matters of this kind; as I have before shewn in treating particularly of this article p. 320, the general method, and explained fully there and elsewhere, the nature of the substances proper to be employed as far as respects this operation.

C H A P.

C H A P. II.

Of silvering.

SILVERING may be practised on the same substances; and by all the same methods, either with leaf or powder we have before pointed out with regard to gilding; variation being made in a few circumstances below mentioned. It is nevertheless but seldom used, notwithstanding the effect would be very beautiful and proper in many cases; and there is an extreme good reason for such a neglect of it. This reason is, its tarnishing in a very short time; and acquiring frequently, besides the general depravity of the whiteness, such spots of various colours, as render it very unsightly: and this tarnish and specking is not only the constant result of time; but will be often produced instantly by any extraordinary moisture in the air, or dampness, as well as by the fumes and effluvia of many bodies which may happen to approach it.

Wherever, therefore, silvering is admitted, a strong varnish ought to be put over it: and this even is not sufficient wholly to secure it from this destructive consequence. The varnish must be some of the compositions of mastic, sandrac, the gums animi or copal, and white resin; (the particular treatment of which in the forming varnishes will be found in other

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parts

parts of this work;) for the other substances used for compounding varnishes are too yellow. Some put a coat of isinglass size over the silver: but, besides that the size itself injures the whiteness in time by turning yellow, it preserves the silver but in a small degree.

The methods of making the silver powders is also the same as those of gold, except with regard to one of the German powders, which is correspondent both in its appearance and use, abating the difference of colour, to the aurum mosaicum or musivum: whence it has been indeed, though improperly, called the argentum musivum. The process for this being, therefore, different from any before given, it is proper to insert it fully, as follows.

“ Take of very pure tin one pound. Put it into
 “ a crucible; and set it on a fire to melt: when it
 “ begins to run into fusion, add to it an equal
 “ proportion of bismuth or tin glass: and stir
 “ the mixture with an iron rod, or the small end
 “ of a tobacco-pipe, till the whole be intirely
 “ melted, and incorporated. Take the cruci-
 “ ble then from the fire; and, after the melted
 “ composition is become a little cooler, but
 “ while it is yet in a fluid state, pour into it
 “ a pound of quicksilver gradually; stirring
 “ it in in the mean time, that the mercury
 “ may be thoroughly conjoined with the o-
 “ ther ingredients. When the whole is thus
 “ commixt, pour the mass out of the cruci-
 “ ble on a stone; where, as it cools, it will
 “ take the form of an amalgama or metalline
 “ paste;

“ paste; which will be easily bruised into a flaky powder ; and is then fit for use.”

This powder may be either tempered, in the manner of the shell gold, with gum water; or rubbed over a ground properly sized, according to any of the methods above directed for gold powders; and it will take a very good polish from the dog's tooth or burnishers; and hold its colour much better with a slight coat of varnish over it, than any true silver powder.

The sizes for silvering ought not to be mixed, as in the case of gold, with yellow, or bole armoniac; but with some white substance, whose effect may prevent any small failures in the covering the ground with the silver from being seen, in the same manner as the yellow substances do the gold. This may be done with flake white, or white lead, when the sizes formed of oil are used: but whiting is the proper matter in the burnish for silvering; or where the glover's or parchment size is used. Some recommend tobacco-pipe clay in the place of whiting; and add a little lamp black to give a silver-like greyishness to the composition.

C H A P. III.

Of bronzing.

BRONZING is colouring, by metalline powders, plaster, or other busts and figures, in order to make them appear as if cast of copper or other metals.

This is sometimes done by means of cement; and sometimes without, in the instance of plaster figures : but the bronzing is more durable and secure when a cement is used.

The gold powders, and the aurum mosaicum, we have before given the preparation of, are frequently employed for this purpose; but the proper bronzing ought to be of a deeper and redder colour, more resembling copper; which effect may be produced by grinding a very small quantity of red lead with these powders; or the proper powder of copper may be used : and may be prepared as follows.

“ Take filings of copper or slips of copper plates; and dissolve them in any kind
 “ of aqua fortis put into a glass receiver, or
 “ other proper formed vessel. When the
 “ aqua fortis is saturated with the copper, take
 “ out the slips of the plates; or, if filings were
 “ used, pour off the solution from what remains undissolved: and put into it small
 “ bars of iron: which will precipitate the
 “ copper from the aqua fortis in a powder of
 “ the

“ the proper appearance and colour of copper. Pour off the water then from the powder ; and wash it clean from the salts, by several successive quantities of fresh water.”

Where the appearance of brass is designed, the gold powders, or the aurum mosaicum, may be mixt with a little of the powder called argentum musivum ; of which the preparation is above given.

Where no cement is used in bronzing, the powder must be rubbed on the subject intended to be bronzed, by means of a piece of soft leather, or fine linnen rag, till the whole surface be coloured.

The former method of using a cement in bronzing was, to mix the powders with strong gum water, or isinglass size ; and then with a brush, or pencil, to lay them on the subject : but at present some use the japanner's gold size : and proceed in all respects in the same manner as in gilding with the powders in other cases : for which ample directions have been before given.

This is the best method hitherto practised ; for the japanner's gold size binds the powders to the ground, without the least hazard of peeling or falling off ; which is liable to happen when the gum water or glover's or isinglass sizes are used : though, notwithstanding the authority of the old practice for the contrary, even these cements will much better secure them when they are laid on the ground, and the

powders rubbed over them, than when both are mixed together, and the effect particularly of the aurum mosaicum will be much better in this way than the other.

The fictitious silver powder, called the *argentum musivum*, may be applied in the manner of bronze, by those whose caprice disposes them to silver figures or busts: but it is the only sort of silver powder, that should be used in this way, for the reason above given: and all such kind of silvering is much better omitted: as the whiteness itself of plaster in figures or busts, and much more a glossy or shining whiteness, is injurious to their right effect; by its eluding the judgment of the eye, with respect to the proper form and proportion of the parts, from the false and pointed reflections of the lights, and the too faint force of the shades: to remove which inconvenience it is probable was the first inducement to bronzing.

C H A P. IV.

Of japanning.

SECT. I. *Of japanning in general.*

BY japanning is to be here understood the art of covering bodies by grounds of opake colours in varnish; which may be either
after-

afterwards decorated by paintings or gilding, or left in a plain state. This is not at present practised so frequently on chairs, tables, and other furniture of houses, except tea waiters, as formerly : but the introduction of it for ornamenting coaches, snuff-boxes, and skreens, in which there is a rivalry betwixt ourselves and the French, renders the cultivation and propagation of this art of great importance to commerce. I shall therefore be more explicit in shewing the methods both now and formerly in use ; with the application of each to the several purposes to which they are best adapted ; and point out at the same time several very material improvements, that are at present enjoyed only by particular persons ; or not at all hitherto brought into practice.

The substances which admit of being japanned are almost every kind that are dry and rigid, or not too flexible : as wood, metals, leather, and paper prepared.

Wood and metals do not require any other preparation, but to have their surfaces perfectly even and clean : but leather should be securely strained either on frames, or on boards ; as its bending or forming folds would otherwise crack and force off the coats of varnish ; and paper should be treated in the same manner ; and have a previous strong coat of some kind of size ; but it is rarely made the subject of japanning till it is converted into *papier maché*, or wrought by other means, into

such form that its original state, particularly with respect to flexibility, is lost.

One principal variation in the manner of japanning is, the using or omitting any priming or undercoat on the work to be jappanned. In the older practice, such priming was always used : and is at present retained in the French manner of japanning coaches and snuff-boxes of the *papier maché* : but in the Birmingham manufacture here, it has been always rejected. The advantage of using such priming or undercoat is, that it makes a saving in the quantity of varnish used ; because the matter of which the priming is composed fills up the inequalities of the body to be varnished : and makes it easy, by means of rubbing and water-polishing, to gain an even surface for the varnish : and this was therefore such a convenience in the case of wood, as the giving a hardness and firmness to the ground was also in the case of leather, that it became an established method ; and is therefore retained even in the instance of the *papier maché*, by the French who applied the received method of japanning to that kind of work on its introduction. There is nevertheless this inconvenience always attending the use of an undercoat of size, that the japan coats of varnish and colour will be constantly liable to be craked and peeled off, by any violence, and will not endure near so long as the bodies jappanned in the same manner, but without any such priming : as may be easily observed in comparing the wear of the Paris and
Birming-

Birmingham snuff-boxes; which latter, when good of their kind, never peel or crack, or suffer any damage, unless by great violence, and such a continued rubbing, as wastes away the substance of the varnish: while the japan coats of the Parisian crack and fly off in flakes whenever any knock or fall, particularly near the edges, exposes them to be injured. But the Birmingham manufacturers, who originally practised the japanning only on metals, to which the reason above given for the use of priming did not extend, and who took up this art of themselves as an invention, of course omitted at first the use of any such undercoat; and not finding it more necessary in the instance of *papier machè*, then on metals, continue still to reject it. On which account the boxes of their manufacture are, with regard to the wear, greatly better than the French.

The laying on the colours in gum water, instead of varnish, is also another variation from the method of japanning formerly practised: but the much greater strength of the work, where they are laid on in varnish or oil, has occasioned this way to be exploded with the greatest reason in all regular manufactures: however, they who may practise japanning on cabinets, or other such pieces, as are not exposed to much wear and violence, for their amusement only, and consequently may not find it worth their while to encumber themselves with the preparations necessary for the other methods, may paint with water colours on an undercoat laid on
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the wood, or other substance of which the piece to be japanned is formed; and then finish with the proper coats of varnish according to the methods below taught: and if the colours are tempered with the strongest isinglass size and hony instead of gum water, and laid on very flat and even, the work will not be much inferior in appearance to that done by the other method; and will last as long as the old japan.

It is practised likewise, in imitation of what is sometimes done in the Indian work, to paint with water colours on grounds of gold; in which case the isinglass size, with sugar candy or hony, as above directed, is the best vehicle.

Of japan grounds.

The proper japan grounds are either such as are formed by the varnish and colour, where the whole is to remain of one simple colour; or by the varnish either coloured, or without colour, on which some painting or other decoration is afterwards to be laid. It is necessary, however, before I proceed to speak of the particular grounds, to shew the manner of laying on the priming or undercoat, where any such is used.

This priming is of the same nature with that called clear coating (or vulgarly clear coaling) practised erroneously by the house painters; and consists only in laying on and drying

drying in the most even manner, a composition of size and whiting. The common size has been generally used for this purpose : but where the work is of a nicer kind, it is better to employ the glover's or the parchment size ; and if a third of isinglass be added, it will be still better ; and if not laid on too thick, much less liable to peel and crack. The work should be prepared for this priming, by being well smoothed with the fish-skin, or glass shaver ; and, being made thoroughly clean, should be brushed over once or twice with hot size, diluted with two thirds of water, if it be of the common strength. The priming should then be laid on with a brush as even as possible ; and should be formed of a size, whose consistence is betwixt the common kind and glue, mixt with as much whiting as will give it a sufficient body of colour to hide the surface of whatever it is laid upon, but not more.

If the surface be very even, on which the priming is used, two coats of it, laid on in this manner, will be sufficient : but if, on trial with a fine rag wet, it will not receive a proper water polish, on account of any inequalities not sufficiently filled up and covered, two or more coats must be given it : and whether a greater or less number be used, the work should be smoothed, after the last coat but one is dry, by rubbing it with the Dutch rushes. When the last coat is dry, the water polish should be given, by passing over every part of it with a fine rag gently moistned, till the whole appear perfectly

perfectly plain and even. The priming will then be completed, and the work ready to receive the painting, or coloured varnish : the rest of the proceedings being the same in this case as where no priming is used.

Of common grounds of varnish, which are to be painted upon.

Where wood or leather is to be japanned, and no priming is used, the best preparation is, to lay two or three coats of coarse varnish composed in the following manner.

“ Take of rectified spirit of wine one pint,
“ and of coarse seed-lac and resin each two
“ ounces. Dissolve the seed-lac and resin in
“ the spirit : and then strain off the varnish.”

This varnish, as well as all others formed of spirit of wine, must be laid on in a warm place ; and, if it can be conveniently managed, the piece of work to be varnished should be made warm likewise : and for the same reason all dampness should be avoided ; for either cold or moisture chill this kind of varnish ; and prevent its taking proper hold of the substance on which it is laid.

When the work is so prepared, or by the priming with the composition of size and whiting above described, the proper japan ground must be laid on : which is much the best formed of shell-lac varnish, and the colour desired ; if white be not in question, which demands a peculiar treatment, as I shall
below,

below explain ; or great brightness be not required, when also other means must be pursued. The composition of the shell-lac varnish, with the reasons why it is preferable to all other kinds as a vehicle for colours, I have before given p. 177 ; and therefore need not repeat them here ; though the advantage of this method over all others, where great brightness is not demanded, and the durability is of consequence, can scarcely be too much urged.

The colours used with the shell-lac varnish may be, any pigments whatever which give the tint of the ground desired ; and they may be mixt together to form browns or any compound colours : but with respect to such as require peculiar methods for the producing them of the first degree of brightness, I shall particularize them below.

The colours for grounds may otherwise be mixed with the white varnishes formed in oil of turpentine ; of which the preparation is given p. 179—213 and 214 : but these varnishes have no advantages over the shell-lac but in their whiteness, that preserves the brightness of the colours ; and they are at the same time greatly inferior in hardness to it.

As metals never require to be under coated with whiting, they may be treated in the same manner as wood or leather when the undercoat is omitted, except in the instances particularly spoken of below.

Of white japan grounds.

The forming a ground perfectly white, and of the first degree of hardness, remains hitherto a desideratum, or matter sought for, in the art of japanning. As there are no substances which form a very hard varnish, but what have too much colour not to deprave the whiteness, when laid on of a due thickness over the work.

The nearest approach, however to a perfect white varnish, already known, is made by the following composition.

“ Take flake white, or white lead, washed
 “ over and ground up with a sixth of its
 “ weight of starch, and then dried ; and
 “ temper it, properly for spreading, with the
 “ mastic varnish prepared as in p. 179, or
 “ compound them with the gum animi, according to the directions given in the same
 “ page.” Lay these on the body to be japanned, prepared either with or without the undercoat of whiting, in the manner as above ordered : and then varnish over it with five or six coats of the following varnish.

“ Provide any quantity of the best seed
 “ lac ; and pick out of it all the clearest and
 “ whitest grains ; reserving the more coloured
 “ and fouler parts for the coarser varnishes,
 “ such as that above mentioned for priming
 “ or preparing wood or leather. Take of this
 “ pickt seed-lac two ounces ; and of gum animi
 “ three

“ three ounces; and dissolve them, being
 “ previously reduced to a gross powder, in a-
 “ bout a quart of spirit of wine; and strain off
 “ the clear varnish.”

The seed-lac will yet give a slight tinge to this composition; but cannot be omitted, where the varnish is wanted to be hard: though, where a softer will answer the end, the proportion may be diminished; and a little crude turpentine added to the gum animi to take off the brittleness.

A very good varnish, free intirely from all brittleness, may be formed by dissolving as much gum animi, as the oil will take, in old nut or poppy oil; which must be made to boil gently, when the gum is put into it. The ground of white colour itself may be laid on in this varnish; and then a coat or two of it may be put over the ground: but it must be well diluted with oil of turpentine when it is used. This, though free from brittleness, is, nevertheless, liable to suffer by being indented or bruised by any slight strokes; and it will not well bear any polish, but may be brought to a very smooth surface without, if it be judiciously managed in the laying it on. It is likewise somewhat tedious in drying, and will require some time where several coats are laid on; as the last ought not to contain much oil of turpentine.

Of blue japan grounds.

Blue japan grounds may be formed of bright Prussian blue; or of verditer glazed over by Prussian blue; or of smalt. The colour may be best mixed with shell-lac varnish; and brought to a polishing state by five or six coats of varnish of seed-lac; but the varnish, nevertheless, will somewhat injure the colour, by giving to a true blue a cast of green; and fouling in some degree a warm blue, by the yellow it contains. Where, therefore, a bright blue is required, and a less degree of hardness can be dispensed with, the method before directed, in the case of white grounds, must be pursued.

Of red japan grounds.

For a scarlet japan ground, vermilion may be used: but the vermilion has a glaring effect, that renders it much less beautiful than the crimson produced by glazing it over with carmine or fine lake; or even with rose pink, which has a very good effect used for this purpose. For a very bright crimson, nevertheless, instead of glazing with carmine, the Indian lake should be used, dissolved in the spirit of which the varnish is compounded (which it readily admits of when good): and, in this case, instead of glazing with the shell-lac varnish, the upper
or

or polishing coats need only be used; as they will equally receive and convey the tinge of the Indian lake, which may be actually dissolved by spirit of wine: and this will be found a much cheaper method than the using carmine. If, nevertheless, the highest degree of brightness be required, the white varnishes must be used.

Of yellow japan grounds.

For bright yellow grounds, the King's yellow, or the turpeth mineral, should be employed, either alone or mixed with fine Dutch pink: and the effect may be still more heightened by dissolving powdered turmeric root in the spirit of wine of which the upper or polishing coat is made; which spirit of wine must be strained from off the dregs, before the seed-lac be added to it to form the varnish.

The seed-lac varnish is not equally injurious here, and with greens, as in the case of other colours; because, being only tinged with a reddish yellow, it is little more than an addition to the force of the colours.

Yellow grounds may be likewise formed of the Dutch pink only; which, when good, will not be wanting in brightness, though extremely cheap.

Of green japan grounds.

Green grounds may be produced by mixing the King's yellow and bright Prussian blue; or rather, the turpeth mineral and Prussian blue: and a cheap, but fouler kind, by verdigrise with a little of the above mentioned yellows, or Dutch pink. But where a very bright green is wanted, the chrystals of verdigrise, (called *distilled verdigrise*) should be employed; and to heighten the effect, they should be laid on a ground of leaf gold, which renders the colour extremely brilliant and pleasing.

They may any of them be used successfully with good feed-lac varnish, for the reason before given: but will be still brighter with the white varnish.

Of orange coloured japan grounds.

Orange coloured japan grounds may be formed, by mixing vermilion, or red lead, with King's yellow, or Dutch pink; or the orange lake, prepared as directed in p. 111, will make a brighter orange ground than can be produced by any mixture.

Of purple japan grounds.

Purple japan grounds may be produced by the mixture of lake, and Prussian blue: or a fouler kind, by vermilion and Prussian blue.

They may be treated as the rest, with respect to the varnish.

Of black japan grounds, to be produced without beat.

Black grounds may be formed by either ivory-black, or lamp-black: but the former is preferable, where it is perfectly good.

These may be always laid on with the shell-lac varnish: and have their upper or polishing coats of common feed-lac varnish; as the tinge or foulness of the varnish can be here no injury.

Of common black japan grounds on iron or copper, produced by means of heat.

For forming the common black japan grounds by means of heat, the piece of work to be japanned must be painted over with drying oil: and when it is of a moderate dryness, must be put into a stove of such degree of heat, as will change the oil black, without burning it so as to destroy or weaken its tenacity. The stove should not be too hot when the work is put into it, nor the heat increased too fast; either of which errors would make it blister: but the slower the heat is augmented, and the longer it is continued, provided it be restrained within the due degree, the harder will be the coat of japan. This kind of varnish requires no polish, having received, when

properly managed, a sufficient one from the heat.

Of the fine tortoise shell japan ground, produced by means of heat.

The best kind of tortoise shell ground produced by heat is not less valuable for its great hardness, and enduring to be made hotter than boiling water without damage, than for its beautiful appearance. It is to be made by means of a varnish prepared in the following manner.

“ Take of good linseed oil one gallon, and
 “ of umbre half a pound. Boil them together till the oil become very brown and
 “ thick: strain it then through a coarse cloth;
 “ and set it again to boil; in which state it
 “ must be continued till it acquire a pitchy
 “ consistence, when it will be fit for use.”

Having prepared thus the varnish, clean well the iron or copper-plate, or other piece which is to be japanned; and then lay vermilion tempered with shell-lac varnish, or with drying oil diluted with oil of turpentine very thinly, on the places intended to imitate the more transparent parts of the tortoise shell. When the vermilion is dry, brush over the whole with the black varnish tempered to a due consistence with oil of turpentine; and when it is set and firm, put the work into a stove, where it may undergo a very strong heat, and must be continued a considerable
 time,

time, if even three weeks or a month, it will be the better.

This was given amongst other receipts by Kunkel; but appears to have been neglected till it was revived with great success in the Birmingham manufactures, where it was not only the ground of snuff boxes, dressing boxes, and other such lesser pieces, but of those beautiful tea waiters, which have been so justly esteemed and admired in several parts of Europe where they have been sent. This ground may be decorated with painting and gilding, in the same manner as any other varnished surface, which had best be done after the ground has been duly hardened by the hot stove: but it is well to give a second annealing with a more gentle heat after it is finished.

SECTION III.

Of painting japan work.

JAPAN work ought properly to be painted with colours in varnish; the methods of which, I have before given, under the article of painting in varnish, in p. 176, and the following; though, in order for the greater dispatch, and, in some very nice works in small, for the freer use of the pencil, the colours are sometimes tempered in oil: which should previously have a fourth part of its weight of

gum animi dissolved in it; or, in default of that, of the gums sandrac or mastic, as I have likewise before intimated. When the oil is thus used, it should be well diluted with spirit of turpentine, that the colours may be laid more evenly and thin: by which means, fewer of the polishing or upper coats of varnish become necessary.

In some instances, water colours, as I before mentioned, are laid on grounds of gold, in the manner of other paintings; and are best, when so used, in their proper appearance without any varnish over them; and they are also sometimes so managed as to have the effect of embossed work. The colours employed in this way, for painting, are (as I before intimated) best prepared by means of isinglass size corrected with hony, or sugar candy. The body of which the embossed work is raised, need not, however, be tinged with the exterior colour; but may be best formed of very strong gum water, thickened to a proper consistence by bole armoniac and whiting in equal parts: which being laid on in the proper figure, and repaired when dry, may be then painted with the proper colours tempered in the isinglass size, or in the general manner with shell-lac varnish.

SECTION IV.

Of varnishing japan work.

THE last, and finishing part of japanning, lies in the laying on and polishing the outer coats of varnish; which are necessary, as well in the pieces that have only one simple ground of colour; as with those that are painted. This is in general best done with common seed-lac varnish; except in the instances, and on those occasions, where I have already shewn other methods to be more expedient: and the same reasons, which decide as to the fitness or impropriety of the varnishes, with respect to the colours of the ground, hold equally well with regard to those of the painting. For where brightness is the most material point, and a tinge of yellow will injure it, seed-lac must give way to the whiter gums: but where hardness, and a greater tenacity, are most essential, it must be adhered to: and where both are so necessary, that it is proper one should give way to the other, in a certain degree reciprocally, a mixt varnish must be adopted.

This mixt varnish, as I before observed, should be made of the pickt seed-lac, as directed in p. 414. The common seed-lac varnish, which is the most useful preparation of the kind hitherto invented, may be thus made.

E c 4

“ Take

“ Take of seed-lac three ounces, and put
“ into water to free it from the sticks and
“ filth that frequently are intermixed with it;
“ and which must be done by stirring it about
“ and then pouring off the water, and adding
“ fresh quantities in order to repeat the opera-
“ tion, till it be freed from all impurities; as
“ it very effectually may be by this means.
“ Dry it then, and powder it grossly; and
“ put it, with a pint of rectified spirit of wine,
“ into a bottle, of which it will not fill above
“ two thirds. Shake the mixture well to-
“ gether; and place the bottle in a gentle
“ heat, till the seed appear to be dissolved;
“ the shaking being in the mean time repeat-
“ ed as often as may be convenient: and then
“ pour off all which can be obtained clear
“ by that method: and strain the remainder
“ through a coarse cloth. The varnish thus
“ prepared must be kept for use in a bottle
“ well stoppt.”

When the spirit of wine is very strong, it will dissolve a greater proportion of the seed-lac: but this will saturate the common, which is seldom of a strength sufficient for making varnishes in perfection. As the chilling, which is the most inconvenient accident attending those of this kind, is prevented, or produced more frequently, according to the strength of the spirit, I will take this opportunity of shewing a method by which, weaker rectified spirits may with great ease, at any time, be freed from

from the phlegm, and rendered of the first degree of strength.

“ Take a pint of the common rectified
“ spirit of wine ; and put it into a bottle, of
“ which it will not fill above three parts.
“ Add to it half an ounce of pearl-ashes, salt
“ of tartar, or any other alkaline salt, heated
“ red hot, and powdered, as well as it can be
“ without much loss of its heat. Shake the
“ mixture frequently for the space of half an
“ hour ; before which time, a great part of
“ the phlegm will be separated from the
“ spirit ; and will appear, together with the
“ undissolved part of the salts, in the bottom
“ of the bottle. Let the spirit then be pour-
“ ed off, or freed from the phlegm and salts
“ by means of a tritorium or separating fun-
“ nel ; and let half an ounce of the pearl-ashes,
“ heated and powdered as before, be added
“ to it, and the same treatment repeated.
“ This may be done a third time, if the
“ quantity of phlegm separated by the addi-
“ tion of the pearl-ashes appear considerable.
“ An ounce of alum reduced to powder and
“ made hot, but not burnt, must then be put
“ into the spirit ; and suffered to remain some
“ hours ; the bottle being frequently shaken.
“ After which, the spirit, being poured off
“ from it, will be fit for use.”

The addition of the alum is necessary, to
neutralize the remains of the alkaline salt or
pearl-ashes ; which would otherwise greatly
deprave the spirit with respect to varnishes and
laquers,

laquers, where vegetable colours are concerned; and must consequently render another distillation necessary.

The manner of using the seed-lac, or white varnishes, is the same; except with regard to the substance used in polishing; which, where a pure white, or great clearness of other colours, is in question, should be itself white: whereas the browner sorts of polishing dust, as being cheaper, and doing their business with greater dispatch, may be used in other cases. The pieces of work to be varnished should be placed near a fire, or in a room where there is a stove; and made perfectly dry: and then the varnish may be rubbed over them by the proper brushes made for that purpose, beginning in the middle, and passing the brush to one end; and then, with another stroke from the middle, passing it to the other. But no part should be crossed or twice passed over, in forming one coat, where it can possibly be avoided. When one coat is dry, another must be laid over it; and this must be continued at least five or six times, or more; if, on trial, there be not a sufficient thickness of varnish to bear the polish, without laying bare the painting, or the ground colour underneath.

When a sufficient number of coats is thus laid on, the work is fit to be polished: which must be done, in common cases, by rubbing it with a rag dipped in tripoli or pumice stone (commonly called *rotten stone*) finely powdered:

ed: but towards the end of the rubbing, a little oil of any kind should be used along with the powder; and when the work appears sufficiently bright and glossy, it should be well rubbed with the oil alone, to clean it from the powder; and give it a still brighter lustre.

In the case of white grounds, instead of the tripoli or pumice stone, fine putty or whiting must be used; both which should be washed over to prevent the danger of damaging the work from any sand or other gritty matter, that may happen to be commixt with them.

It is a great improvement of all kinds of japan work, to harden the varnish by means of heat; which, in every degree that it can be applied short of what would burn or calcine the matter, tends to give it a more firm and strong texture. Where metals form the body, therefore, a very hot stove may be used, and the pieces of work may be continued in it a considerable time; especially if the heat be gradually increased: but where wood is in question, heat must be sparingly used; as it would otherwise warp or shrink the body, so as to injure the general figure.

SECTION V.

Of gilding japan work.

ALL the methods of gilding, which are applicable to the ornamenting japan work, having been before taught under the article of gilding, it is needless to repeat them here; I shall only again observe, that in gilding with gold size (which is almost the only method now practised in japan work,) where it is desired to have the gold not shine, or approach in the least towards the burnishing state, the size should be used either with oil or turpentine only, or with a very little fat oil; but where a greater lustre, and appearance of polish, are wanting, without the trouble of burnishing, and the preparation necessary for it, fat oil alone, or mixed with a little gold size, should be used; and the same proportionable effect will be produced from a mean proportion of them.

CHAP. V.

Of laquering.

LAQUERING is the laying either coloured or transparent varnishes on metals, in order to produce the appearance of a different

different colour in the metal ; or to preserve it from rust and the injuries of the weather.

Laquering is therefore much of the same nature with japanning, both with regard to the principles and practice ; except that no opaque colours, but transparent tinges alone, are to be employed.

The occasions on which laquering is now in general used are three : where brass is to be made to have the appearance of being gilt : where tin is wanted to have the resemblance of yellow metals : and where brass or copper locks, nails, or other such matters, are to be defended from the corrosion of the air or moisture. There was indeed formerly another very frequent application of laquering ; which was colouring frames of pictures, &c. previously silvered, in order to give them the effect of gilding ; but this is now greatly disused. These various intentions of laquering require different compositions for the effectuating each kind ; and as there is a multiplicity of ingredients which may be conducive to each purpose, a proportionable number of recipes have been devised, and introduced into practice ; especially for the laquering brass work to imitate gilding ; which is a considerable object in this kind of art ; and has been improved to the greatest degree of perfection. I shall, however, only give one or two recipes for each ; as they are all which are necessary ; the others being either made too complex by ingredients not essential to the intention, or too costly

costly by the use of such as are expensive ; or inferior in goodness, from the improper choice or proportion of the component substances.

The principal body or matter of all good laquers used at present is seed-lac ; but, for coarser uses, resin, or turpentine, is added ; in order to make the laquer cheaper, than if the seed-lac, which is a much dearer article, be used alone. Spirit of wine is also consequently the fluid or menstruum of which laquers is formed ; as the ethereal oils will not dissolve the seed-lac : and it is proper that the spirit should be highly rectified for this purpose. As it is seldom practicable, nevertheless, to procure such spirits from the shops, it will be found very advantageous to use the method above given for dephlegmating it by alkaline salts ; but the use of the alum, directed in that process, must not be forgotten on this occasion ; as the effect of the alkaline salt would otherwise be the turning the metal of a purplish instead of a golden colour, by laying on the laquer.

The following are excellent compositions for brass work which is to resemble gilding.

“ Take of turmeric ground, as it may be had
 “ at the dry salters, one ounce, and of saffron
 “ and Spanish annatto each two drams. Put
 “ them into a proper bottle, with a pint of
 “ highly rectified spirit of wine ; and place
 “ them in a moderate heat, if convenient,
 “ often shaking them, for several days. A
 “ very strong yellow tincture will then be obtained ; which must be strained off from the
 “ dregs

“ dregs through a coarse linnen cloth : and
“ then, being put back into the bottle, three
“ ounces of good seed-lac powdered grossly
“ must be added, and the mixture placed a-
“ gain in a moderate heat, and shaken, till the
“ seed-lac be dissolved ; or at least such part of
“ it as may. The laquer must then be strained
“ as before ; and will be fit for use ; but must
“ be kept in a bottle carefully stopt.

“ Where it is desired to have the laquer
“ warmer or redder than this composition may
“ prove, the proportion of the annatto must
“ be increased ; and where it is wanted cooler,
“ or nearer a true yellow, it must be diminished.”

The above, properly managed, is an extreme good laquer ; and of moderate price : but the following, which is cheaper, and may be made where the Spanish annatto cannot be procured good, is not greatly inferior to it.

“ Take of turmeric root ground one ounce,
“ of the best dragon’s blood half a dram,
“ Put them to a pint of spirit of wine, and
“ proceed as with the above.”

By diminishing the proportion of the dragon’s blood, the varnish may be rendered of a redder, or truer yellow cast.

Saffron is sometimes used to form the body of colour in this kind of laquer, instead of the turmeric ; but though it makes a warmer yellow, yet the dearth of it, and the advantage which turmeric has in forming a much stronger tinge in spirit of wine, not only than the saffron,

fron, but than any other vegetable matter hitherto known, gives it the preference. Though being a true yellow, and consequently not sufficiently warm to overcome the greenish cast of brass, it requires the addition of some orange coloured tinge to make a perfect laquer for this purpose.

Aloes and gamboge are also sometimes used in laquers; but the aloes is not necessary where turmeric or saffron are used; and the gamboge, though a very strong milky yellow in water, affords only a very weak tinge in spirit of wine.

The varnish for tin may be made as follows.

“ Take of turmeric root one ounce, of dragon’s blood two drams, and of spirit of wine one pint. Proceed as in the former.”

This may, like the former, have the red or yellow rendered more prevalent by the increasing or diminishing the proportion of the dragon’s blood. Where a coarser or cheaper kind is wanted, the quantity of seed-lac may be abated; and the deficiency thence arising supplied by the same proportion of resin.

The laquer for locks, nails, &c. where little or no colours is desired, may either be seed-lac varnish alone as prepared above, or with a little dragon’s blood: or a compound varnish of equal parts of seed-lac and resin, with or without the dragon’s blood.

The manner of laying on the laquer is as follows.

I

First

First let the pieces of work to be laquered be made thoroughly clean; which, if they be new founded, this must be done by means of aqua fortis. Being ready, they must be heated by a small charcoal fire in a proper vessel, or any way that may be most convenient: the degree must not be greater than will admit of their being taken hold of without burning the hand. The laquer must then be laid on by a proper brush in the manner of other varnishes; and the pieces immediately set again in the same warm situation. After the laquer is thoroughly dry and firm, the same operation must be renewed again for four or five times, or till the work appear of the colour and brightness intended. For very fine work, some use a less proportion of seed-lac; which occasions the laquer to lie evener on the metal: but in this case a greater number of coats are required; which multiplies the proportion of labour; though, where the price of the work will allow for such additional trouble, it will be the more perfect for it.

The laquering tin may be performed in the same manner, as is here directed for brass: but being for coarser purposes less nicety is observed; and fewer coats (or perhaps one only) are made to suffice; as the laquer is made very red, that the tinge may have the stronger effect.

Locks, nails, &c. where laquer is only used in a defensive view, to keep them from corroding, and not for the improvement of the colour, may be treated in the same manner:

F f

but

but one or two coats are generally thought sufficient. Though where any regard is had to the wear, the coats of laquer or varnish should always be of a due thickness, when they are to be exposed to the air ; otherwise, the first moist weather makes them chill, and look grey and misty, in such manner, that they are rather injurious than beneficial to the work they are laid upon.

C H A P. VI.

Of staining wood, ivory, bone, horn, alabaster, marble, and other stones, of various colours.

SECT. I. *Of staining wood.*

Of staining wood yellow.

TAKE any white wood ; and brush it over several times with the tincture of turmeric root, made by putting an ounce of the turmeric ground to powder to a pint of spirit ; and, after they have stood some days, straining off the tincture. If the yellow colour be desired to have a redder cast, a little dragon's blood must be added, in the proportion that will produce the teint required.

A

A cheaper, but least strong and bright yellow, may be given to wood by rubbing it over several times with the tincture of the French berries, prepared as in p. 102, and made boiling hot. After the wood is again dry, it should be brushed over with a weak alum water used cold.

Lesser pieces of wood, instead of brushed over with them, may be soaked in the decoctions or tinctures.

Wood may be also stained yellow by means of aqua fortis; which will sometimes produce a very beautiful yellow colour, but at other times a browner. The wood should be warm, when the aqua fortis is laid on; and be held to the fire immediately afterwards; and care must be taken, that either the aqua fortis be not too strong; or that it be sparingly used; otherwise a brown, sometimes even blackish, may be the result.

In order to render any of these stains more beautiful and durable, the wood should be rushed after it is coloured; and then varnished by the seed-lac varnish; or, when desired to be very strong, and to take a high polish, with three or four coats of shell-lac varnish, and as many of that of seed-lac.

Of staining wood red.

For a bright red stain for wood, make a strong infusion of Brazil in stale urine, or water impregnated with pearl ashes in the proportion of an ounce to a gallon; to a gallon of either of which, the proportion of Brasil wood

F f 2

must

must be a pound : which being put to them, they must stand together two or three days, often stirring the mixture. With this infusion strained, and made boiling hot, brush over the wood to be stained, till it appear strongly coloured : then, while yet wet, brush it over with alum water made in the proportion of two ounces of alum to a quart of water.

For a less bright red, dissolve an ounce of dragon's blood in a pint of spirit of wine ; and brush over the wood with the tincture, till the stain appear to be as strong as is desired.

For a pink or rose red, add to a gallon of the above infusion of Brazil wood two additional ounces of the pearl ashes, and use it as was before directed : but it is necessary, in this case, to brush the wood over often with the alum water. By increasing the proportion of pearl ashes, the red may be rendered yet paler : but it is proper, when more than this quantity is added, to make the alum water stronger.

These reds, when it is necessary, may be varnished as the yellows.

Of staining wood blue.

Wood may be stained blue by means either of copper, or indico : but the first will afford a brighter colour ; and is more generally practicable than the latter ; because the indico can be used only in that state to which it is brought by the manner of preparation used by the dyers : of whom indeed it must be had, as it cannot

cannot be properly so prepared but in large quantities, and with a particular apparatus. The method of staining blue with the copper is therefore as follows.

“ Take a solution of copper, made according to the directions given in p. 86; and brush it while hot several times over the wood. Then make a solution of pearl ashes, in the proportion of two ounces to a pint of water; and brush it hot over the wood, stained with the solution of copper, till it be of a perfectly blue colour.”

Wood stained green as above by verdigrise, may likewise be made blue, by using the solution of the pearl ashes in the same manner.

When indico is used for staining wood blue, it must be managed thus.

“ Take indico prepared with sope-lees as when used by the dyers; and brush the wood with it boiling hot. Prepare then a solution of white tartar or cream of tartar, which is to be made by boiling three ounces of the tartar, or cream, in a quart of water: and with this solution, used copiously, brush over the wood before the moisture of the tincture of indico be quite dried out of it.”

These blues may be rushed and varnished as the reds where there is occasion.

Of staining wood of mahogany colour.

Mahogany colour is the most useful of any stain for wood (especially since the fineering

with different colours is out of fashion) as it is much practised at present for chairs and other furniture made in imitation of mahogany ; which, when well managed, may be brought to have a very near resemblance.

This stain may be of different hues, as the natural wood varies greatly, being of all the intermediate tints betwixt the red brown, and purple brown, according to the age, or sometimes the original nature of different pieces.

For the light red brown, use a decoction of madder, or fustic wood, ground in water ; the proportion may be half a pound of madder, and a quarter of a pound of fustic, to a gallon : or in default of fustic an ounce of the yellow berries may be used. This must be brushed over the wood to be stained, while boiling hot, till the due colour be obtained : and, if the wood be kindly grained, it will have greatly the appearance of new mahogany.

The same effect nearly may be produced by the tincture of dragon's blood, and turmeric root, in spirit of wine : by increasing or diminishing the proportion of each of which ingredients, the brown stain may be varied to a more red or yellow cast at pleasure. This succeeds better upon wood which has already some tinge of brown, than upon whiter.

For the dark mahogany take the infusion of madder made as above, except the exchanging the fustic for two ounces of logwood : and when the wood to be stained has been several times brushed over, and is again dry, it must
be

be slightly brushed over with water in which pearl ashes have been dissolved, in the proportion of about a quarter of an ounce to a quart.

Any stains of the intermediate colours may be made by mixing these ingredients, or varying the proportion of them.

Where these stains are used for better kind of work, the wood should be afterwards varnished with three or four coats of seed-lac varnish; but for coarse work, the varnish of resin and seed-lac may be employed, or they may be only well rubbed over with drying oil.

Of staining wood green.

Dissolve verdigrise in vinegar, or chrystals of verdigrise in water; and, with the hot solution, brush over the wood till it be duly stained.

This may be rushed and varnished as the above.

Of staining wood purple.

Brush the wood to be stained several times with a strong decoction of logwood and Brasil, made in the proportion of one pound of the logwood, and a quarter of a pound of the Brazil, to a gallon of water; and boiled for an hour or more. When the wood has been brushed over till there be a sufficient body of colour, let it dry; and then be slightly passed over by a solution of one dram of pearl ashes in a quart

of water. This solution must be carefully used, as it will gradually change the colour from a brown red, which it will be originally found to be, to a dark blue purple ; and therefore its effect must be restrained to the due point for producing the colour desired.

This may be varnished as the rest.

Of staining wood black.

Brush the wood several times with the hot decoction of logwood made as above ; but without the Brasil : then, having prepared an infusion of galls, by putting a quarter of a pound of powdered galls to two quarts of water, and setting them in the sun-shine, or any other gentle heat, for three or four days, brush the wood three or four times over with it : and then pass over it again, while yet wet, with a solution of green vitriol in water, in the proportion of two ounces to a quart.

The above is the cheapest method : but a very fine black may be produced, by brushing the wood several times over with a solution of copper in aqua fortis ; and afterwards with the decoction of logwood, which must be repeated till the colour be of sufficient force ; and the greenness, produced by the solution of the copper, wholly overcome.

These blacks may be varnished as the other colours.

Where

Where the stains are desired to be very strong, as in the case of wood intended to be used for fineering, it is in general necessary, they should be soaked, and not brushed; to render which the more practicable the wood may be previously slit, or sawed, into pieces of a proper thickness for inlaying.

It is to be understood also, that when the wood is above ordered to be brushed several times over with the tinging substances, it should be suffered to dry betwixt each time.

SECTION II.

Of staining ivory, bone, or horn.

Of staining ivory, bone, or horn yellow.

BOIL them first in a solution of alum, in the proportion of one pound to two quarts of water: and then prepare a tincture of the French berries, by boiling half a pound of the berries, pounded, in a gallon of water with a quarter of a pound of pearl ashes. After this tincture has boiled about an hour, put the ivory, &c. previously boiled in the alum water, into it; and let them remain there half an hour.

If turmeric root be used, instead of the French berries, a brighter yellow may be obtained;

tained ; but the ivory, &c. must in that case be again dipt in alum water after it is taken out of the tincture ; otherwise an orange colour, not a yellow, will be produced from the effect of the pearl ashes on the turmeric.

Of staining ivory, bone, and born green.

They must be boiled in a solution of verdigrise in vinegar ; or of copper in aqua fortis, prepared as above directed, (a vessel of glass or earthen ware being employed for this purpose,) till they be of the colour desired.

Of staining ivory, bone, and born red.

Take strong lime water, prepared as for other purposes ; and the raspings of Brasil wood, in the proportion of half a pound to a gallon. Let them boil for an hour ; and then put in the ivory, &c. prepared by boiling in alum water in the manner above directed for the yellow ; and continue it there till it be sufficiently coloured. If it be too crimson, or verge toward the purple, it may be rendered more scarlet, by dipping again in the alum water.

Of staining ivory, bone, and born blue.

Stain the ivory, &c. first green, according to the manner above directed ; and then dip it in a solution of pearl ashes made strong and boiling hot : but it must not be continued longer, nor
dipt

dipt oftner, than is necessary to convert the green to blue.

The ivory, &c. may otherwise be boiled in the tincture of indico prepared as by the dyers; and afterwards in the solution of tartar made as is directed for the staining wood.

Of staining ivory, bone, and horn purple.

Treat them in the same manner as was directed for red; except that logwood must be substituted in the place of Brasil wood; and the use of the alum water must be omitted wholly.

If a redder purple be wanted, a mixture of the logwood and Brasil must be employed, instead of the logwood alone. The proportion may be equal parts; or any less proportion of the Brasil, according to the colour desired.

Of staining horn to imitate tortoise shell.

The horn to be stained must be first pressed into proper plates, or scales, or other flat form. The following mixture must then be prepared.

“ Take of quicklime two parts, and of litharge one; and temper them to the consistence of a soft paste with sope-lye.”

Put this paste over all the parts of the horn, except such as are proper to be left transparent, in order to the greater resemblance of the tortoise shell. The horn must then remain thus covered with the paste till it be thoroughly dry:
when

when the paste being brushed off, the horn will be found partly opake, and partly transparent, in the manner of tortoise shell; and when put over a foil, of the kind of latten called affidue, will be scarcely distinguishable from it. It requires some degree of fancy, and judgment, to dispose of the paste in such a manner, as to form a variety of transparent parts of different magnitude and figure, to look like the effect of nature; and it will be an improvement to add semi-transparent parts: which may be done by mixing whiting with some of the paste to weaken its operation in particular places: by which spots of a reddish brown will be produced; that, if properly interspersed, especially on the edges of the dark parts, will greatly increase as well the beauty of the work, as its similitude with the real tortoise shell.

To stain ivory, bone, and horn, black.

Proceed in the same manner as is above directed for wood.

SECTION III.

*Of staining paper, or parchment, of various colours.**Of staining paper, or parchment, yellow.*

PAPER may be stained yellow by the tincture of French berries prepared as in p. 102 : but a much more beautiful colour may be obtained by using the tincture of turmeric, formed by infusing an ounce or more of the root, powdered, in a pint of spirit of wine. This may be made to give any teint of yellow from the lightest straw to the full colour called French yellow ; and will be equal in brightness even to the best dyed silks. If yellow be wanted of a warmer or redder cast, annatto, or dragon's blood, must be added to the tincture.

The best manner of using these, and the following tinctures, is to spread them even on the paper or parchment by means of a broad brush in the manner of varnishing.

Of staining paper, or parchment, red.

Paper, or parchment, may be stained red by treating it in the same manner as is directed for wood p. 435 ; or by red ink. It may also be stained of a scarlet hue by the tincture of dragon's blood in spirit of wine : but this will not be bright.

A very fine crimson stain may be given to paper, by a tincture of the Indian lake; which may be made by infusing the lake some days in spirit of wine; and then pcuring off the tincture from the dregs.

Of staining paper, or parchment, green.

Paper, or parchment, may be stained green, by the solution of verdigrise in vinegar; or by the chrystals of verdigrise dissolved in water. As also by the solution of copper in aqua fortis made by adding filings of copper gradually to the aqua fortis till no ebullition ensues: or spirit of salt may be used in the place of the aqua fortis.

Of staining paper, or parchment, blue.

A blue colour may be given to paper, or parchment, by staining it green by any of the abovementioned methods; and treating it afterwards as is directed for the staining wood blue, by the same means; or by indico, in the manner there explained likewise.

Of staining paper, or parchment, orange.

Stain the paper, or parchment, first of a full yellow, by means of the tincture of turmeric as above directed. Then brush it over with a solution of fixt alkaline salt, made by dissolving half an ounce of pearl ashes, or salt
of

of tartar, in a quart of water, and filtering the solution.

Of staining paper, or parchment, purple.

Paper, or parchment, may be stained purple by archal: or by the tincture of logwood, according to the method above directed for staining wood. The juice of ripe privet berries expressed will likewise give a purple dye to paper or parchment.

SECTION IV.

Of staining alabaster, marble and other stones, of various colours.

ALABASTER, marble, and other stones, may be stained of a yellow, red, green, blue, purple, black, or any of the compound colours, by the means above given for staining wood: but it is better, when a strong tinge is wanted, to pour the tincture, if made in water, boiling hot on the alabaster, &c. spreading it equally on every part, than to brush it over only; though that may be sufficient where a slighter dye will suffice. When tinctures in spirit of wine are used, they must not be heated; as the spirit would evaporate, and leave the tinging gums in an undissolved state.

Where stones are not perfectly white, but partake of brownness or greyness, the colour produced by the tinges will be proportionably wanting in brightness : because the natural colour of the stone is not hid or covered by these tinges ; but combines with them : and, for the same reason, if the stone be of any of the pure colours, the result will be a compound of such colour and that of the tinge.

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